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THE MONTANA
ENERGY CONSERVATION PLAN

PREPARED FOR

THE MONTANA ENERGY OFFICE

By

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PREFACE

Governor Thomas L. Judge set the tone for the Montana Energy Conservation Plan in his energy message to the 45th Legislative Assembly on January 18, 1977. In that message, Governor Judge made the following statement:

> "During the last four years, Montana has become the nation's leader in design and enforcement of environmental safeguards. During the next four years, Montana should become the nation's leader in conservation of its energy resources and elimination of waste in their usage.
>
> "At this point in our history, government must demonstrate its determination to reduce consumption of all resources -- fiscal as well as natural. The number one priority and the basic cornerstone of our energy policy must be reduction of energy demand; any other course is ultimately suicidal."

Simply stated, the intent of this project is to follow the lead of the Governor and create a plan which will make energy conservation the keystone of Montana's energy policy.

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CHAPTER I

PLAN INTENT

INTRODUCTION

The constraints of increasingly scarce energy affect all parts of the United States. Montana, like other states with a relative abundance of energy resources, is no exception and today must face critical questions regarding future supply. The presence of vast reserves of coal in Montana creates an illusion that somehow we are exempt from the need to ponder the consequences of future energy shortfalls. Coal currently cannot be used in many sectors of Montana's energy economy, and its massive long-range development may have important negative consequences. Meanwhile, two major current sources of energy -- natural gas and crude oil imports from Canada -- will be curtailed within a few short years. A sober assessment of this situation leads to the endorsement of conservation as immediately necessary if Montana, whose non-renewable energy sources are in great demand, is to attain energy self-sufficiency and be able to bridge the gap to a non-fossil fueled energy future.

Realizing that the example must come from the State, under strong executive leadership and with broad support of the Montana Legislature, the State intends to implement the strongest possible plan of energy conservation. The 1977 Legislature funded the Montana Energy Office in the office of the Lieutenant Governor. The primary responsibilities of that office include

advising the Governor on all matters involving energy and energy-related resources. In addition, it is to prepare a comprehensive energy policy for the State which is to include:

A. A state program for energy conservation;

B. A state program for emergency allocation of electric energy in the event of shortage;

C. A state program for emergency allocation of fuel in the event of shortage;

D. Maximum practicable use of alternative energy sources.

This plan, when implemented, will satisfy the requirement for an energy conservation program. The plan focuses on specific methods of achieving an immediate reduction of energy use as a partial answer to a dwindling supply. It also recognizes the importance of developing an ethic of energy conservation as a way of life for all Montanans which includes a long-range commitment to alternative energy sources as well as change in life style. Thus, great emphasis is placed upon creating a comprehensive and coordinated plan for involving all elements of Montana society in saving energy in every sector of current use. When implemented, the elements of the energy conservation plan outlined in this document will exceed the requirements imposed in the Energy Policy and Conservation Act (P.L. 94-163) which addresses energy conservation in five areas: (1) lighting efficiency standards for public buildings; (2) car pools, van pools, and public transportation; (3) standards and policies for improving the energy efficiency of the procurement practices of the state and its political subdivisions; (4) thermal efficiency standards for new and renovated buildings; and (5) a traffic law which permits right turns on red after stop. Additionally,

the Supplemental Plan requirements have added the program measures: (6) energy audits; (7) energy audit education; and (8) program management -- inter-governmental coordination. The goal of the program is a 5 percent reduction in each state's projected 1980 energy consumption.

Initially, it is necessary to define energy conservation and the philosophical framework followed during development of the plan. We define energy conservation as "the efficient utilization of energy." Energy conservation does not necessarily imply curtailment. We do not propose to conserve energy by closing Montana's industries or not heating Montana's homes. Nor do we view energy conservation and renewable energy development as being counter to Montana's economic development plans. Energy conservation will create jobs. Both energy conservation and renewable energy development are labor intensive rather than capital intensive since their application primarily is in decentralized small-scale and individual use. Most of Montana's homes and businesses need more insulation and should be weatherized more fully. The state's industries can purchase more energy efficient equipment. As a long term measure, solar heating devices can be manufactured and sold in Montana. Energy conservation and renewable energy development present excellent opportunities for both Montana business and labor.

A sincere commitment to these principles will guarantee a marked reduction in total energy consumption within Montana, while actually enhancing other goals such as economic development, employment and environmental protection.

A fundamental assumption of this plan is that energy conservation

will be successful only if Montanans embrace the principle voluntarily and enthusiastically. To this end, major emphasis is placed upon programs of education and economic incentive. A significant responsibility ultimately is left with the private sector, under the assumption that Montanans will realize and will pursue energy conservation measures which assist them as individuals while contributing to the welfare of the entire state. Mandated measures are limited and are extended principally to activities of governments within the state on the grounds that leadership by example is the best method of promoting compliance.

The easy availability and low cost of energy in Montana has allowed us to defer important decisions regarding energy production and utilization. Government, business and citizens share this blinder vision. Now it is time to refocus together on the hard choices which confront us. We have vast quantities of coal, but also unlimited supplies of wind and sun. Shall we choose to spend the energy principal of non-renewable resources or live off the energy interest of renewable resources? A commitment to intensive energy conservation practices today will provide us with a larger margin of time available for reaching a decision on future alternative energy tracks.

MONTANA'S ENERGY CONSUMPTION PATTERNS

According to the Federal Energy Administration (FEA), Montana consumed 340 trillion BTUs of energy in 1975. FEA projects that Montana's energy consumption will reach 370.5 trillion BTUs by 1980.

In 1974, Montana's gross per capita energy consumption was 440 million

BTUs. This compares to a national per capita average of 340 million BTUs. Montana's high per capita consumption is the result of many factors including climatological characteristics, a concentration of resource extractive industries within the state and Montana's large land mass and dispersed population. Per capita energy consumption in Montana grew at a rate of almost 3 percent per year in the 1960's. Between 1970 and 1973, Montana's per capita energy consumption grew at a 2 percent annual rate, and since 1973, energy growth has slowed to less than 1 percent per year. Following is a sectorial breakdown of the energy consumption patterns within Montana.

RESIDENTIAL

The residential sector consumes about 15 percent of the energy used in Montana. Eighty-eight percent of this energy is used for space and water heating. The remaining energy is used to power lights and appliances. Two-thirds of the energy used in the residential sector comes from natural gas. The remaining energy use is broken down almost evenly between electricity and other sources such as propane and fuel oil.

COMMERCIAL

The commercial sector also accounts for about 15 percent of the energy used in Montana. Of this, about 75 percent is used directly in commercial buildings. In commercial buildings, about 62 percent of the energy used is for space heating and air conditioning. An additional 28 percent is used for lighting. Natural gas accounts for about 50 percent of the energy used in commercial buildings, electricity accounts for 35 percent, and the remaining energy is divided between fuel oil, coal and propane.

INDUSTRIAL

Over the past decade, energy consumption in Montana industry has grown faster than the energy consumption of any other sector. Montana industries currently consume 44 percent of the total energy used in the state. Montana industry consumes 40 percent of all natural gas sold within the state as well as over 60 percent of all electricity. In 1976, Montana industry consumed over 28 billion cubic feet of natural gas. This energy use is concentrated in a few basic industries (mineral mining and processing, wood products and paper, oil refining, food products and cement). For example, in 1976, the Anaconda Company and Hoerner Waldorf together consumed over 44 percent of all the natural gas distributed to industry.

AGRICULTURE

The agriculture sector (farm/ranch production) accounts for 4.4 percent of Montana's fuel and electric usage, including the natural gas and oil required to produce needed fertilizer and pesticides. The production of crops in Montana accounts for 95 percent of the energy used in agriculture, while livestock production requires 5 percent. Fertilizer and pesticides manufacturing consumes 44 percent of the total energy used in crop production, and field operations and farm vehicles account for 56 percent.

TRANSPORTATION

Transportation presently accounts for about 25 percent of the nation's direct fuel consumption. An additional 18 percent of the U.S. energy budget is used indirectly to build and maintain vehicles, construct roads, etc.

In contrast, Montana's transportation sector directly used 31 percent

of the total energy consumed in the state in 1976. The use of motor gasoline in Montana has grown fairly steadily at an average annual growth rate of about 3 percent since 1950. The majority of the gasoline consumed in Montana in 1976 was produced at in-state refineries. Only 17 percent of the feedstock for Montana refineries was produced in Montana in 1976. About 47 percent of the feedstock for Montana refineries currently is imported from Canada. This feedstock is scheduled to be eliminated in the 1980's, and replacement feedstocks have not been located yet. Gasoline consumption accounts for 73 percent of the energy used in the transportation sector, highway diesel fuel accounts for another 9 percent, and the remaining 18 percent is used by railroads.

GOVERNMENT

The energy consumption statistics related to government operations generally are included within the commercial and transportation sectors. However, since Montana government has total control over its own energy consumption, we decided to address specific high use government operations separately.

Energy consumption in Montana government operations is substantial. For instance, in fiscal year 1975, 11 Montana state government building complexes consumed over 1.7 billion cubic feet of natural gas. Warm Springs State Hospital, where natural geothermal waters flow to the surface, consumed 212 million cubic feet of this total. Montana state and local governments also operate several thousand motor vehicles. Each year, the various Montana political subdivisions spend millions of dollars in various energy consuming procurements.

Montana governments have authority in the area of solid waste management. In the State of Montana, the energy equivalent of 50×10^{12} BTUs is processed as solid waste and used for land fill annually. This resource includes paper, glass, metals and plastics. In addition, another 1.7×10^{12} BTUs of fuel in the form of organic burnable wastes (food, grass clippings, etc.) is thrown away.

Montana state and local governments also are responsible for sewage treatment. The present system for sewage treatment considers sewage an undesirable waste product rather than a resource. In actual fact, the energy content of the sewage treated in Montana is about 1×10^{12} BTUs per year. This resource also has a fertilizer value in some applications.

The handling and purifying of these wastes require about 1.5 million BTUs per million gallons of sewage. For residential uses alone, the State of Montana consumes 3.2×10^{10} BTUs for sewage treatment. When industrial and commercial uses are considered, this figure triples. In addition, the technologies involved require great quantities of water which is in itself a scarce and valuable resource.

ENERGY CONSERVATION GOAL

The Federal Energy Administration estimates that Montana will consume 370.5 trillion BTUs of energy during the calendar year 1980. The goal of the FEA energy conservation program is a 5 percent reduction in this projected consumption level. Thus, to participate in the FEA program, Montana should propose projected 1980 energy savings of at least 18.53 trillion BTUs.

As was noted in the introduction, Montana has chosen to move well beyond the five FEA mandatory areas and investigate energy conservation and renewable energy measures applicable to all sectors of Montana's economy. While Montana's plan focuses on both short- and long-term measures, particular emphasis was given to those measures which would have a significant and fundamental long-term impact. This plan was developed not only to save 5 percent of Montana's 1980 energy consumption but to make energy conservation and renewable energy a major long-term energy supply technology.

PLAN STRUCTURE

As stated previously, the Montana Energy Conservation Plan has two basic goals to satisfy:

1. Satisfy the requirement for a 5 percent reduction in energy consumption by December 31, 1980;

2. Satisfy the requirement for long-range energy conservation strategies.

Previous editions of this plan do not include a clear statement of the master strategy to be followed in the attainment of these goals. In other words, the destination was stated but no map was given of how to use available resources to attain the goals.

It is necessary, for effective planning, to provide a program structure that ties all of the influencing factors together in a logical, systematic framework that enables one to determine whether or not proposed actions will lead toward the stated goals of energy conservation for the State. To accomplish this it was decided to diagram the Montana plan using

the Functional Analysis System Technique (FAST). The concept was developed by Univac and was first used in improving manufacturing processes and hardware application for the military services. The Commonwealth of Pennsylvania has been credited with significant development of the technique in its application to improving the delivery of governmental services. Since that time several states have used the concept to analyze and structure countermeasure programs in such equally complex programs as highway safety and health systems planning.

Once developed, the FAST diagram, or logic chart, becomes a very useful management tool for such functions as priority setting, resource allocation and evaluation. The diagram is developed in such a way that one reads the chart from left to right by asking the question, "How are we going to accomplish this goal (objective)?" The chart can also be read from right to left by asking the question, "Why are we doing this?" The result is a clear understanding of the hierarchical structure involved in an endeavor of this magnitude and an understanding of the sequencing of events necessary to accomplish the broader goal.

The logic chart, Figure I-1 on the following page, illustrates the major concepts of a comprehensive energy program for Montana.

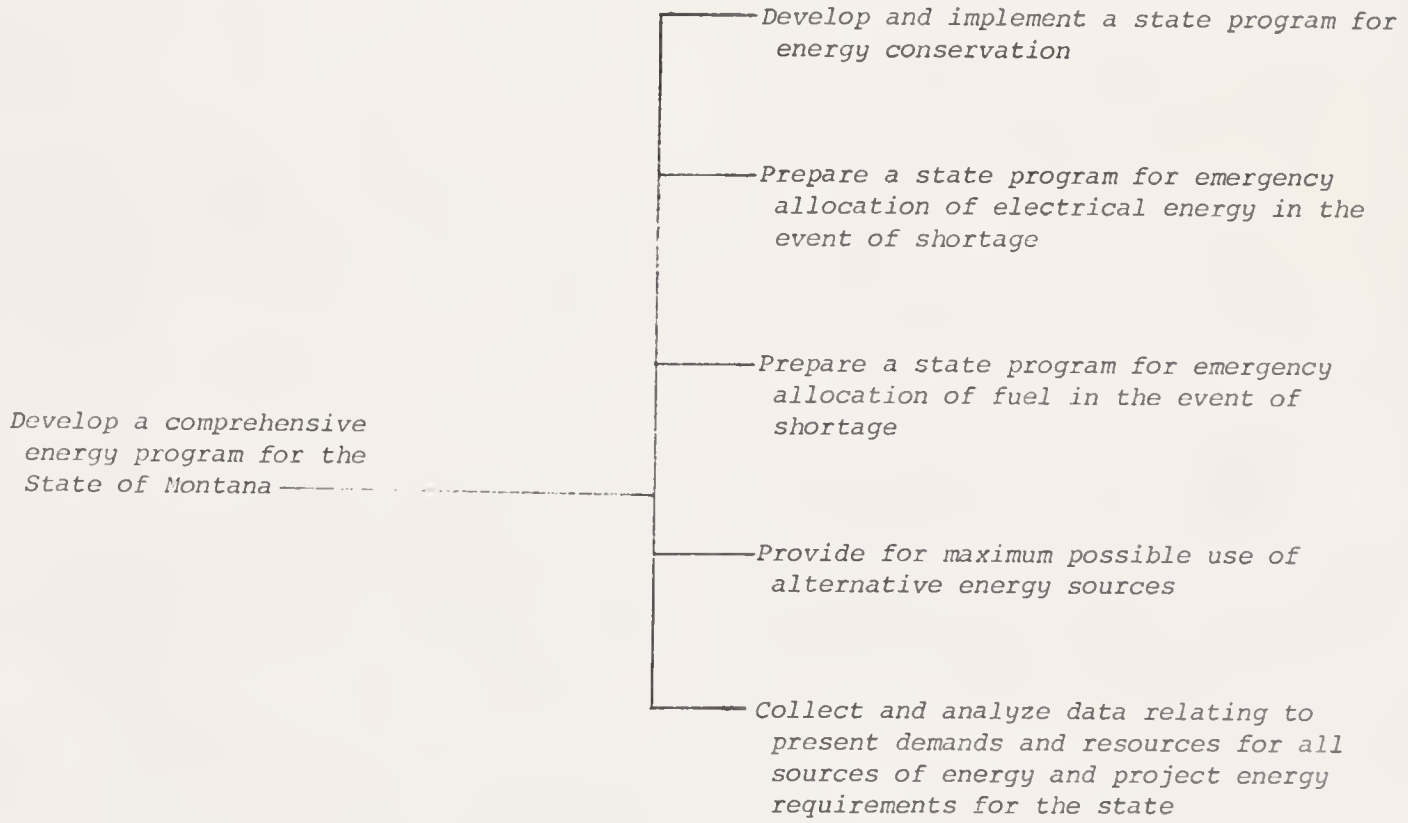
Develop a comprehensive energy program for the State of Montana
Develop and implement a state program for energy conservation
Prepare a state program for emergency allocation of electrical energy in the event of shortage
Prepare a state program for emergency allocation of fuel in the event of shortage
Provide for maximum possible use of alternative energy sources
Collect and analyze data relating to present demands and resources for all sources of energy and project energy requirements for the state

Figure I-1. Logic Chart of Major Concepts for Developing a Comprehensive Energy Program for the State of Montana

For the purposes of this document, only those portions of the "state program for energy conservation" dealing with the goal of reducing energy consumption by 5 percent by 1980 will be developed. The logic chart, Figure I-2 on page 13, illustrates how the energy consumption objective is dependent on five (5) sector strategies.

Additional information on the implementation plan for each sector strategy is contained in Chapter IV of this document.

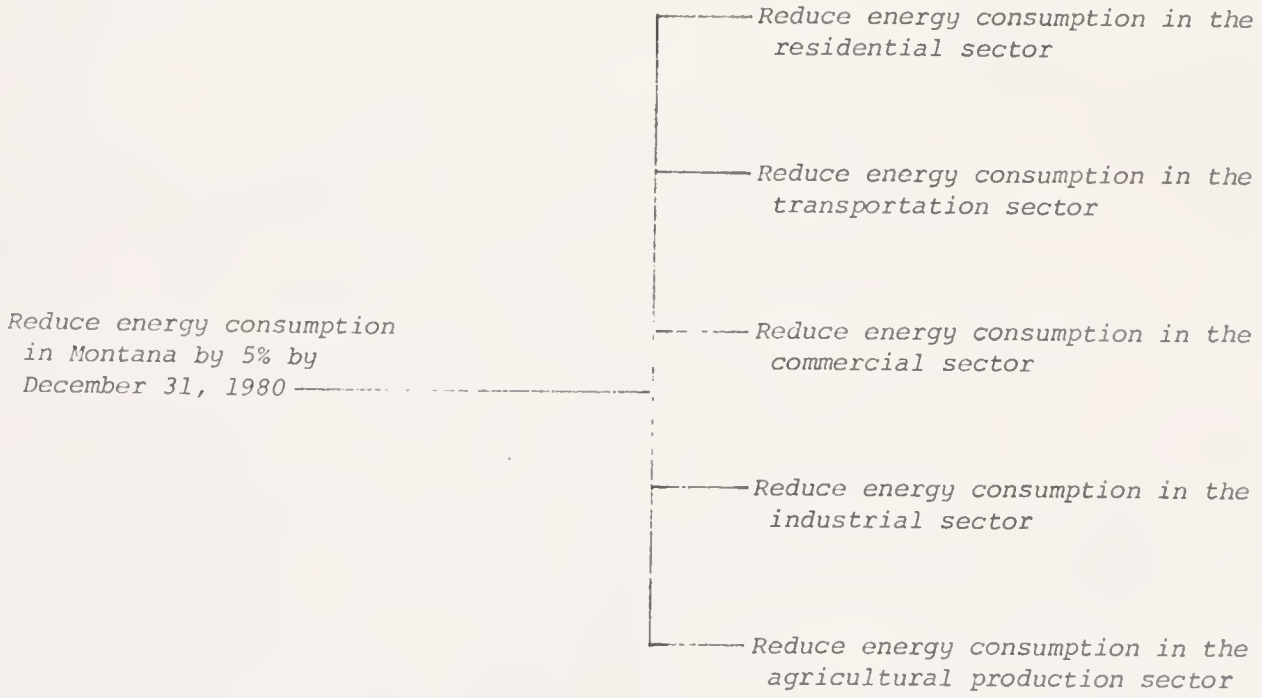
Reduce energy consumption in Montana by 5% by December 31, 1980
Reduce energy consumption in the residential sector
Reduce energy consumption in the transportation sector
Reduce energy consumption in the commercial sector
Reduce energy consumption in the industrial sector
Reduce energy consumption in the agricultural production sector

Figure I-2. Logic Chart of Sectors for Reducing Energy Consumption in Montana by Five Percent by December 31, 1980

CHAPTER II

PLAN SUMMARY

The estimated energy savings shown on the following page reflect the current status of the Program Measures discussed in Chapter III. It will be noted that the previously estimated energy savings for Program Measures 5a, Public Transportation and Railroad Assistance Fund (1.0 trillion BTUs) and 7, Conservation Loan Programs (1.83 trillion BTUs) have been deleted from this plan. Enabling legislation for these Program Measures failed to pass the 1977 Legislative Session.

The total estimated energy savings anticipated by 1980 is less than that shown in our original plan but slightly more than that suggested by the FEA in a September 1, 1977, letter from the Regional Administrator. Explanation of the energy savings goal for each Program Measure is contained in Chapter III, Description of Program Measures.

Program Measures	1980 Estimated Energy Savings (in Trillion BTUs)	Estimated Cost of Implementation (in $000's) 1978	1979	1980
1. State Building Code and Thermal Efficiency Standards	1.06	140	110	110
2. Lighting Standards for Public Buildings	1.36	(See Program Measure 1)		
3. Procurement: Life Cycle Cost Analysis and Vehicle Fuel Efficiency Standards	0.10	35	40	40
3a. Energy Managing, Auditing, and Retrofitting State Buildings	0.79	230	230	230
3b. Renewable Energy Demonstration Project	Uncertain		Uncertain	
4. Right-Turn-on-Red (Already in Force)	No Savings	0	0	0
5. Carpool/Vanpool: Increase in Transit Level of Service	0.05	226	16	16
5a. Public Transportation and Railroad Assistance Fund	(Failed to Pass Legislature)	0	0	0
5b. Bikeway Construction	0.003	250	250	250
5c. Enforcement of 55 MPH Speed Limit	2.18	255	1,350	1,400
6. Weatherization	0.29	610	710	810
7. Conservation Loan Programs	(Failed to Pass Legislature)	0	0	0
8. Renewable Energy Tax Credit	0.25	1,030	1,130	1,230
9. Public Utility Measures	6.99	125	160	160
10. Energy Conservation Education	No Savings	315	370	430
10a. Public Education - Energy Audit Sub-program	No Savings	90	90	90
11. Energy Audits	3.45	380	350	400
12. Program Administration - Coordination	No Savings	72	65	65
13. Energy Conservation Data Base	No Savings	27	35	35
Crude Oil Saving	0.29			
TOTALS	16.813	3,785	4,906	5,266

Table II-1. Montana Estimated Energy Savings as of January 1, 1978

CHAPTER III

DESCRIPTION OF PROGRAM MEASURES

Energy conservation will become an integral part of Montana's daily lives only when its benefits are perceived clearly. Individuals must be made aware of the significant economic and environmental advantages of saving energy from traditional sources in the short run and of shifting to alternative energy supplies in the long term. Energy consumption patterns can be changed in three basic ways:

1. Government can force compliance with standards, as in the case of fuel quotas, taxation for excessive use, or financial penalties;

2. Incentives can be provided to alter use patterns, as in the case of low interest loans for insulation or tax credits for industrial retrofitting;

3. Educational programs can address the multitude of energy saving techniques in virtually every category of energy end use in Montana.

Most of the specific implementation strategies involve either mandated or incentive programs or a combination of the two approaches. The following discussion provides definitions, examples and rationales for the two basic categories.

MANDATORY PROGRAMS

Fuel allocation programs, rationing, and forced reduction of energy consumption are effective in saving energy under conditions of crisis. Mandatory programs like these sometimes are required, but they should be used

sparingly and in the proper circumstances. Mandatory programs may include direct compliance measures or severe tax sanctions, as in the case of greatly escalated gasoline taxes which could produce a shift to smaller automobiles. In either case, they run the risk of possible public antagonism and resistance which could damage the broader energy conservation program. For the most part, mandated measures have been confined to areas specifically required by the FEA and to other areas of government activity brought under direct control more easily.

INCENTIVE PROGRAMS

Examples of incentive programs include tax subsidy measures, direct assistance such as weatherization, low interest loans, state assistance for energy audits, permissive legislation which could allow communities to experiment with alternative energy systems, and provision of matching funds for acquisition of federal monies. Incentive programs are appropriate when they stimulate the self-interest economic motive on the part of individuals. They are advantageous when they have an economic multiplier effect, as in the stimulation of jobs with the weatherization program. This approach should be maximized where short-term energy savings can be realized appreciably, as in the case of weatherization. Since public resources are involved, programs should be chosen which have minimal bureaucratic costs for compliance and have the greatest potential for private sector economic ripple effect.

BASE PLAN MEASURES

CALENDAR 1978 MODIFICATIONS

The Program Measure descriptions contained in the following pages follow the same numbering sequence and carry the same titles as were presented in previous editions of this plan and the supplemental plan. Changes have been made in the wording of the Program Measure where it was found appropriate based on our current status of plan implementation.

Two Program Measures have been dropped from further consideration for the 1980 objective. They are:

Program Measure 5a -- Public Transportation and Railroad Assistance Fund

Program Measure 7 -- Conservation Loan Program

Efforts to secure enabling legislation failed during the 1977 Legislative Session. Because of the nature of these Program Measures it is doubtful that any measurable benefit by 1980 would result from passage of enabling legislation during the 1979 Session. To further pursue the development of support for these programs in the interim results in questionable productivity of the limited resources available.

As stated previously, the projected energy savings attributed to these Program Measures have been assigned to Program Measure 1, State Building Code and Thermal Efficiency Standards, and a combination of Program Measures 10, Energy Conservation Education; 10a, Public Education - Energy Audit Subprogram; and 11, Energy Audits. The rationale for making this assignment is included in the description of the appropriate Program Measure.

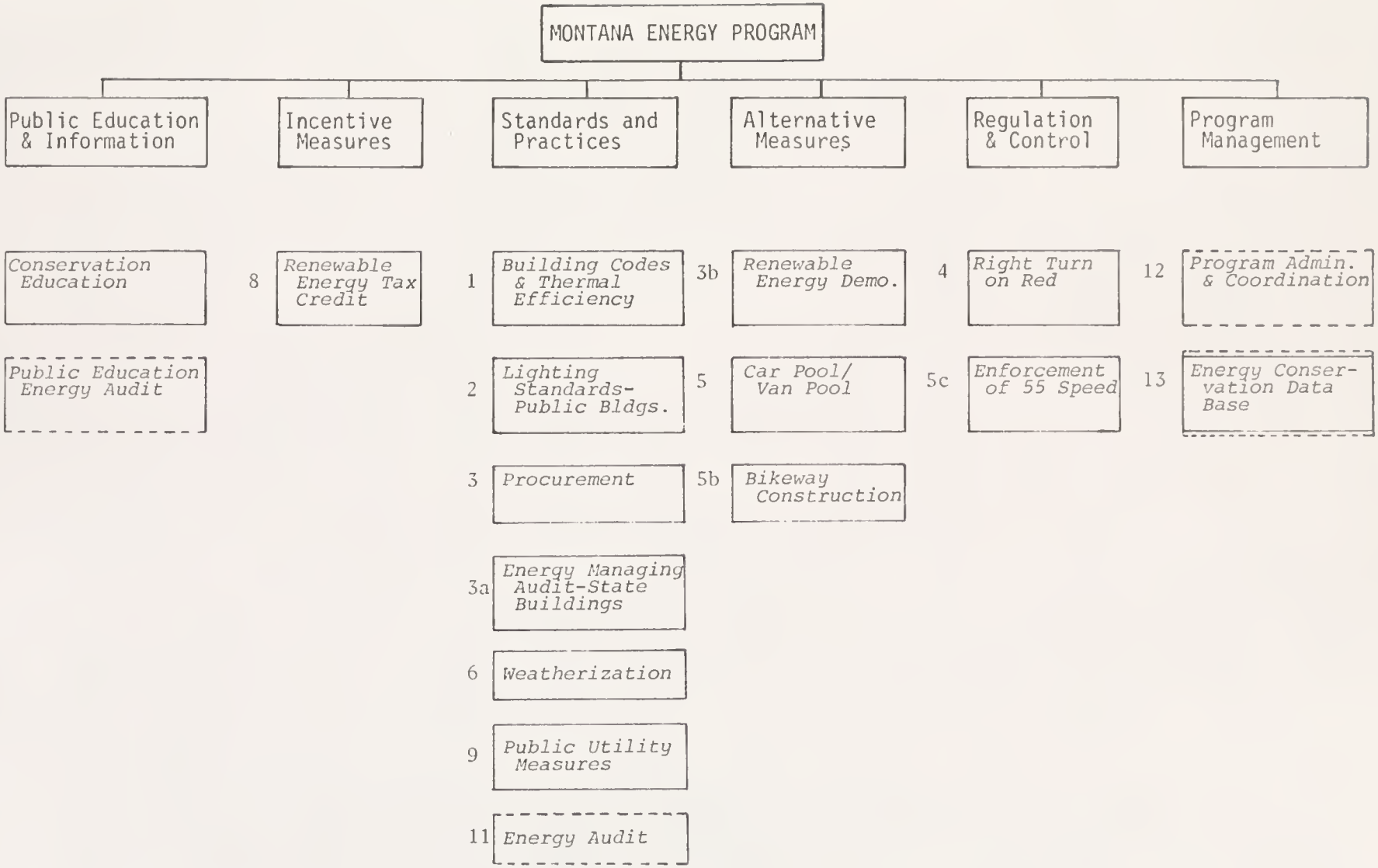

Figure III-1. Classification of Program Measures

PROGRAM MEASURE 1: STATEWIDE BUILDING CODE AND THERMAL EFFICIENCY STANDARDS

NARRATIVE STATEMENT

Previous editions of this plan contained a target date of January 1, 1978, for adoption of a Statewide Energy Conservation Building Code for public buildings. The current status of the effort would now indicate a revised target date of February 28, 1978, as the date for official adoption of the Code. Public hearings on the proposed Code were held on December 5, 1977. The revised Montana Code will conform to the energy conservation provisions of ASHRAE 90-75.

The revised Montana Code will be applicable to construction and renovation of all public buildings (includes those privately owned but open to the public) upon publication. Local jurisdictions will have to adopt these new provisions as a part of their local building codes before they will become applicable to residential construction. Since there are no statutory requirements to force local jurisdictions to adopt the State Code, it will be necessary to undertake a structured information and assistance program to facilitate adoption as soon as possible. At this time we expect to concentrate our efforts initially on those communities where the greatest growth in new construction is anticipated.

OBJECTIVES

- To adopt Statewide Energy Conservation-related building codes for public buildings by February 28, 1978
- To disseminate information and provide training programs necessary to implement, operate and enforce the program by June 1, 1978

- To train local building inspectors from the thirty municipalities having some form of building code enforcement in the provisions of the new code

- To identify and work with fifteen communities in which the largest residential development is anticipated, to facilitate adoption of local building codes consistent with the State Code by December 31, 1978

The State Department of Administration is currently under contract to the MEO to provide training for local building inspectors in the thirty municipalities having some form of building code enforcement. We anticipate that this will help inform local municipalities of the intent of the revised code but recognize that more will need to be done to assure that as many new housing starts as possible will be covered by the new code. For that reason, we propose to work with the Department of Administration in concentrating assistance efforts on those fifteen municipalities where the largest number of new housing starts are anticipated. Historical data and projected economic activity will be used to make the determination of which cities should be included. At this time our best estimate is that the candidate list would be nearly identical to the largest fifteen cities in the State.

We also recognize that other groups must be informed about the energy conservation features of the new code if the expected savings are to be realized. To achieve this end we expect to work with the Department of Administration to make explanatory materials and workshops available to architects, designers, developers and lending institutions associated with the building industry in Montana.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

The previous edition of this plan suggested an estimated energy savings for this Program Measure of approximately 2.44 trillion BTU's. However, upon re-examination of the methodology followed and discussions with Federal Energy Conservation officials we find that this estimate is quite inflated and significantly above that which is reasonable to expect.

The original calculations for this program measure was based on the following assumptions which did not prove to be the case:

- It was anticipated that the new building code would take effect prior to the fourth quarter of 1977. The new code is now targeted for an effective date of February 3, 1978. This slippage in effective date resulted in less time available for the code to affect building construction before 1978.

- Perhaps the most significant erroneous assumption was the failure to consider estimated building construction time in applying the savings features to new building starts. This feature is particularly significant in estimating energy savings realized from application of the building codes to high rise residential and office buildings. Using FEA suggested building construction times we find that there is approximately 2.5 years between code application and full occupancy. This means that energy

savings to be realized from new building starts must be calculated using a 6 month period of time rather than nearly 3 years as was contained in the original calulations. These construction lead times vary with the type of construction and become less significant as one moves toward the less complex buildings such as single family residences.

- A third factor contained in the orgininal calculations that inflated the estimated savings from single family residences was use of a savings percentage based on building code requirements more stringent than those finally published. The more stringent building code requirements suggested at that time were estimated to result in a 64% energy savings in a typical home as opposed to a 27% estimated savings based on ASHRAE 90-75 requirements. In retrospect it appears that the 27% savings is a much more realistic and attainable goal.

Taking all of these factors into consideration, we find that an estimated energy savings goal of 1.06 trillion BTU's for the Program Measure appears to be considerably more realistic than that previously estimated. This goal is the same as that suggested by the FEA in their September 1, 1977 letter commenting on the original plan.

EVALUATION

- New building codes adopted by February 28, 1978
- Training program initial training completed by June 1, 1978; expanded by December 31, 1978
- Percentage of new construction adhering to new code

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Statewide Building Code and Thermal Efficiency Standards

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Enact building code law revisions	Complete									
A. Draft										
B. Introduce										
C. Legislative Review										
2. Prepare revised building codes										
A. Draft	Complete									
B. Review	Complete									
C. Enact		Complete								
3. Provide training for local building code inspectors and lending institutions										
A. Compile training materials	Complete									
B. Develop training courses	Complete									
C. Conduct training workshops			Complete	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
4. Initiate sample audit of compliance				Begin	Complete	Continue	- - - -	- - - -	- - - -	- - - -
5. Review, revise and update building codes								Review	- - - -	Revise

Table III-2. Program Measure 1

ESTIMATED COSTS OF IMPLEMENTATION (000's)

(Includes Costs for Program Measure 2)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	55	85	
		(10)	State Agencies
		(25)	Political Subdivisions
		(50)	Public
1979	20	90	
1980	20	90	

Table III-3. Program Measure 1

PART III
BUDGET INFORMATION

STATE Montana

Table III-4. Program Measure 1

DATE 1/2/78

Tasks 3 & 4 will be contracted to the Department of Administration

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE*** (f)	Total (g)
1. Task 3	80.001	$	$	$ 50,000	$ 85,000	$ 135,000
2. Task 4	80.001			5,000	-	5,000
3.						
4.						
5. TOTALS		$	$	$ 55,000	$ 85,000	$ 140,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 3	(2) Task 4	(3)	(4)	
a. Personnel 24 man/mo	$ 25,000	$	$	$	$ 25,000
b. Fringe Benefits	3,500				3,500
c. Travel	6,500				6,500
d. Equipment					
e. Supplies	5,000				5,000
f. Contractual 1000 man/hrs	10,000	500 man hrs 5,000			15,000
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 50,000	$ 5,000	$	$	$ 55,000
l. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 2: LIGHTING STANDARDS FOR PUBLIC BUILDINGS

NARRATIVE STATEMENT

Lighting efficiency standards are included within the building code program described under Program Measure 1. The same implementation strategies and target deadlines apply.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

The previous edition of this plan indicated an estimated energy savings of 1.36 trillion BTUs. On September 1, 1977, the Regional Administrator, FEA, accepted this estimate as a reasonable goal for this Program Measure. However, as discussed in Program Measure 1, the length of time these requirements will be in effect has been reduced from 3.15 years used in the original computations to 2.875 years. The FEA methodology was tested for sensitivity to this change in time and it was found that there was virtually no change in the projected savings.

Milestones, objectives, costs of implementation, and evaluation are described in detail in Program Measure 1.

PROGRAM MEASURE 3: PROCUREMENT: LIFE CYCLE COST ANALYSIS AND VEHICLE FUEL EFFICIENCY STANDARDS

NARRATIVE STATEMENT

The public sector provides broad opportunity for substantial energy savings. State and local governments utilize large amounts of energy, directly in operations, and indirectly through the purchase of buildings, equipment and materials. Governments, like private citizens, have not been inspired by the need to eliminate wasteful energy use until quite recently. This Program Measure will make energy conservation a salient principle of daily government activities and will produce significant direct savings. In addition, the example set by government should serve indirectly to promote savings in the private sector by providing exemplary patterns for emulation by businesses.

The State is in a current stage of physical plant growth. The capitol building complex is under expansion, and additions or renovations are being made to numerous public facilities, including university campus buildings, state hospitals and detention facilities. This period of new construction should be made to symbolize a state policy of long-term investment in energy conservation and renewable energy.

The intent of our current contract with the State Department of Administration is to re-evaluate the expenditure of approximately $46 million annually by the State of Montana and implement procurement practices more responsive to the conservation of energy and the development of purchasing policies directed to this goal. To accomplish this intent the Department of Administration, Purchasing Division has agreed to complete the following

activities:

1. Review and evaluate current State procurement practices;

2. Develop procedures to eliminate procurement policies which are not responsive to the energy needs of the State;

3. Identify purchasing techniques that insure the procurement of more energy efficient products and materials;

4. Identify energy saving methods developed by the National Association of State Purchasing Officials and the Public Procurement Research Foundation, Inc., which can be incorporated into Montana's procurement system;

5. Apply National Association of State Purchasing Officials' standards to items purchased by the State when appropriate;

6. Explore the feasibility of purchasing an increased amount of recycled materials;

7. Modify the vehicle procurement formula to reflect a realistic life cycle cost;

8. Implement a training program to allow buyers and specification writers to incorporate energy efficient practices in their procurement activities;

9. Establish an assessment program to evaluate the accomplishments of the Agreement;

10. Develop an effective reporting system to permit the recording and display of program results.

OBJECTIVE

- To insure the technical resources are available to implement energy efficient procurement practices in Montana government

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

Previous editions of this plan contained an estimated energy savings of 0.32 trillion BTUs attributed to this Program Measure. In a September 1,

1977, letter, the FEA suggested that a more reasonable goal for this Program Measure would be a 0.10 trillion BTUs. Our recent review of the program, recognizing the lack of passage of several pieces of legislation during the 1977 Session, leads us to conclude that the revised estimate of 0.10 trillion BTUs is a realistic estimate of savings for this Program Measure.

EVALUATION

- Monitoring of procurement practices to insure their energy efficiency

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Procurement: Life Cycle Cost Analysis and Vehicle Fuel Efficiency Standards

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Conduct survey of state purchasing system	Begin			Complete						
2. Develop and disseminate procedures for life cycle cost analysis A. Prepare B. Dissemination			Begin			Complete	Continue	- - - -	- - - -	- - - -
3. Revised procurement practices available to state and local governments						Begin	Continue	- - - -	- - - -	- - - -
4. Procurement practices initiated by state and local governments							Begin	Continue	- - - -	- - - -

Table III-5. Program Measure 3

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	25	10	State Agencies
1979	25	15	
1980	25	15	

Table III-6. Program Measure 3

PART III
BUDGET INFORMATION

STATE Montana

DATE 1/2/78

Table III-7. Program Measure 3

Task 2 will be contracted to the Department of Administration

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 2	80.001	$	$	$ 25,000	$ 10,000	$ 35,000
2.						
3.						
4.						
5. TOTALS		$	$	$ 25,000	$ 10,000	$ 35,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 2	(2)	(3)	(4)	
a. Personnel	$ 12,500	$	$	$	$ 12,500
b. Fringe Benefits	1,750				1,750
c. Travel	1,000				1,000
d. Equipment					
e. Supplies	2,000				2,000
f. Contractual	7,750				7,750
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 25,000	$	$	$	$ 25,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385. Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 3a: ENERGY MANAGING, AUDITING, AND RETROFITTING STATE BUILDINGS

NARRATIVE STATEMENT

The components of this Program Measure include: energy auditing in existing state buildings, improved energy management for state buildings, and conservation retrofitting in state buildings on a priority basis.

The energy audit program now being conducted by the State Department of Administration will develop a standard evaluation methodology which can be utilized by administrators of state and local buildings not selected for the audit sample which, nevertheless, could benefit from analysis. Efforts have been made to encourage the participation of the private sector for the purposes of assisting in designing the audit procedures and promoting widespread use of the completed audit procedure in the private sector.

While it is expected that the energy audit program currently underway by the Department of Administration will provide valuable suggestions for both structural and operational modifications of buildings, a program of energy management does not need to await results of the audit. Immediate savings can result from implementing known techniques which require little additional resource outlay. This has been proven rather forcefully by early results of a study being conducted on six state buildings in Helena. Simply educating maintenance personnel and building users in the efficient management of thermostat settings, illumination levels, hot water control, equipment maintenance, and ventilation can achieve short-run savings.

To accomplish these energy savings, Governor Judge has issued an

executive order requiring the Department of Administration to specify and put into effect more efficient management practices in the operation of existing state buildings. Such measures could save on the order of 15 to 30 percent of the energy use in existing buildings.

Major retrofitting will occur in those buildings discovered by the energy audit to be in greatest need and capable of producing the most savings at the lowest cost of retrofitting. As in the case of life cycle cost procurement, the state is in a good position to make important leadership contributions since the state owns its buildings and can afford the years necessary to recapture the investment cost. As a large fuel consumer, the state must adopt this hedge against the inflation of fuel costs and must show private citizens the advantages of doing so themselves.

OBJECTIVES

- Implementation of fundamental energy management techniques in all state facilities through executive order by July 1, 1977
- Establish a system for carrying out energy audits of existing state buildings by January 1, 1978
- Design energy management programs for buildings which have been audited by April 1, 1978
- Implement conservation retrofitting in state buildings on a priority basis as established by the audit program by July 1, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

Estimates of energy savings discussed in previous editions of this plan are considered reasonable. We propose no change from the estimate of 0.79 trillion BTUs as agreed to by the FEA.

EVALUATION

- Issuance of executive order followed by 10 percent reduction in energy use in state facilities for a period of at least six months
- System of auditing state buildings by January 1, 1978
- Designation of an energy conservation coordinator in each state facility serving more than 50 people
- Designation of 10 top payoff investments for retrofit by November 1, 1978

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Energy Managing, Auditing, and Retrofitting State Buildings

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop energy management practices	Begin	Complete	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
2. Develop and implement an energy management program in state government	Begin		Complete	Continue	- - -	- - - -	- - - -	- - - -	- - - -	- - - -
3. Develop energy audit procedures for state buildings A. Draft B. Test C. Finalize	Begin	Complete				Review				
4. Conduct energy audit program	Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
5. Initiate minor retrofitting practices				Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -
6. Initiate major retrofitting program						Legislative Action		Begin	Continue	- - - -

Table III-8. Program Measure 3a

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	30	200	State Agencies
1979	30	200	
1980	30	200	

Table III-9. Program Measure 3a

PART III
BUDGET INFORMATION

STATE Montana

Table III-10. Program Measure 3a

DATE 1/2/78

Task 2 will be contracted with the Department of Administration

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 2	80.001	$	$	$ 30,000	$ 200,000	$ 230,000
2.						
3.						
4.						
5. TOTALS		$	$	$ 30,000	$ 200,000	$ 230,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity (1) Task 2	(2)	(3)	(4)	Total (5)
a. Personnel 24 man/mo	$ 25,000	$	$	$	$ 25,000
b. Fringe Benefits	3,500				3,500
c. Travel					
d. Equipment					
e. Supplies	1,500				1,500
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 30,000	$	$	$	$ 30,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 3b: RENEWABLE ENERGY DEMONSTRATION PROJECT

NARRATIVE STATEMENT

In addition to the direct savings resulting from changes in energy use patterns of the state government, the potential demonstration effect of state activities for private behavior is quite large. Because of the great diversity of both renewable and non-renewable energy sources in the state, a number of projects could be undertaken to illustrate the fact that Montana is, by no means, locked into traditional energy use patterns. Even though certain projects might not be cost effective in the short term themselves, they are worth supporting for their value in stimulating public awareness of the wide range of innovative energy sources that currently are possible both in technological and economic terms.

Serious consideration has to be given to creating model projects in more than one energy use sector. Solar heating of a highly visible state building is one possibility. Another project might be the conversion of the Warm Springs State Hospital to geothermal heat as part of a renovation of that facility.

An attempt to obtain legislative authority to install solar heat equipment on a state building failed to pass the 1977 Legislative session. It is uncertain as to whether or not further attempts to obtain such legislation will be made in the 1979 session.

In the interim, we have published and distributed the *Montana Renewable Resources Handbook*. We will continue to promote the concept in our normal public information and education efforts.

OBJECTIVES

- Publish and distribute 2,000 copies of the *Montana Renewable Resources Handbook* by July, 1977
- Through the energy audit and management program, determine the most appropriate renewable energy form for selected state buildings by July 1, 1978
- Develop potential funding plan for conversion to renewable forms of energy for each building selected based upon local, state and federal funding sources by December 31, 1978
- Prepare and distribute to legislators a study assessing both the initial and life cycle costs of converting ten large-scale state buildings to renewable energy forms by January 1, 1979

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

The extent of energy savings from this Program Measure obviously depends on the degree to which conversions are effected. Feasibility studies alone will save no energy. Because we cannot recommend a specific appropriation for conversion at this time (the 1979 Legislature must address this), we presently cannot attribute any direct energy savings to this Program Measure.

EVALUATION

- None anticipated other than monitoring activities

ESTIMATED COSTS OF IMPLEMENTATION

The costs of implementation are far too uncertain to estimate. No direct DOE funding is anticipated.

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Renewable Energy Demonstration Project										
TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop and print *Montana Renewable Resources Handbook*	Complete										
2. Develop coordinated effort relating to applications in the State Building Program		Begin			Complete						
3. Prepare specific recommendations relating to ten state buildings for renewable forms of energy concept						Complete					

Table III-11. Program Measure 3b

PROGRAM MEASURE 4: RIGHT TURN ON RED

NARRATIVE STATEMENT

Montana has a "right turn on red" traffic law enacted July 1, 1975, (RCM 32-2137):

> Vehicular traffic facing the signal shall stop before entering the crosswalk on the near side of the intersection or, if none, then before entering the intersection and shall remain standing until green or "Go" is shown alone or until a right turn can safely be made and in making such turn vehicular traffic must yield the right-of-way to pedestrians lawfully within the crosswalk and to other traffic lawfully using the intersection. If a traffic sign legend indicating that no right turn on red may be made after a stop is posted at said intersection, such movement cannot be made until green or "Go" is shown alone.

Because Montana has a "right turn on red" traffic law, estimates of milestones, energy savings and implementation costs are not applicable. No direct action or expense on this Program Measure is anticipated at this time.

PROGRAM MEASURE 5: CAR POOL/VAN POOL: INCREASE IN TRANSIT LEVEL OF SERVICE

NARRATIVE STATEMENT

The transportation sector in Montana offers considerable prospect for energy savings because of the high percentage of total energy use it constitutes. At the same time, it must be remembered that reduction in fuel use is quite difficult in a highly rural state where transportation is a critical link between dispersed pockets of population. The greatest opportunity for savings in the mandated Program Measures in transportation lies in the more urbanized areas where incentives are necessary to increase the number of persons per vehicle. In response to FEA requirements, two Montana cities with urban area populations of between 50,000 to 100,000 have been selected for car pool/van pool matching campaigns (Billings) and increased levels of transit service (Billings and Missoula).

Both car pooling and increased levels of transit service can produce direct energy savings and the residual benefits of reduced peak hour traffic congestion, air pollution, and transportation for the aged or disabled. But habits associated with the use of private automobiles are difficult to break and may require time to alter. The Program Measures described here would be most effective under conditions in which complementary measures (such as increased motor fuel taxes or increased parking fees) were imposed. Nonetheless, it is possible to show net energy savings from car pooling and mass transit if imaginative and aggressive promotional programs are implemented. Four additional Montana urban areas have submitted demonstration project responses to the Federal Urban Mass Transit Act (UMTA), and other communities

have initiated voluntary car pooling projects, which are indications of the potential for energy gains from broadening these programs.

A plan exists for implementing a car pool system for Billings and only requires sufficient funding to be in place by January 1, 1978. Funds to support the program have been proposed in the Emergency Highway Energy Conservation Act, available initially to the communities on a 90/10 federal/state match basis.

The plan for increasing the transit level of service in Billings calls for significant increases in service and ridership based on a reduction of headway time from 45 minutes to 20 minutes. The increased level of service is dependent upon the purchase of new buses.

Voters in Missoula approved creation of a metropolitan transit district to provide service within the incorporated area. The plan provides for establishment of a core system in 1977 and expansion in subsequent years (through 1980). The savings attributable to this initiation of transit service are comparable to the increase expected in the upgrading of the Billings program. Both Billings and Missoula have been successful in securing funds to proceed as planned. Their expanded transit level of service programs are coordinated through their respective local metropolitan planning organizations.

OBJECTIVES

- To provide assistance to the City of Billings in soliciting funds for institution of car pool program by January 1, 1978
- To provide technical assistance to City of Missoula to initiate a mass transit program by January 1, 1978
- To survey potential funding sources available to support expansion of existing mass transit systems in Billings by November 1, 1977

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980 -- Billings Car Pool

Assuming that ten percent of the working force participates, it would result in a reduction of 12,836 vehicle miles of travel per day in Billings, which amounts to 237,120 gallons/year or .02964 x 10^{12} BTUs/year. Applying the annual growth rate in gasoline consumption of three percent (reflecting both the increased number of miles driven and participation in the car pool program) would give a total savings of .0353 x 10^{12} BTU. Because of the estimated small savings, the *Guidelines for Travel Demand Analysis of Program Measures to Promote Carpools, Vanpools and Public Transportation*, prepared for the Federal Energy Administration by Cambridge Systematics, Incorporated, was not used to calculate the potential energy savings. The City of Billings conducted a comprehensive car pooling analysis which is used for this analysis.

Billings chose to use the FHWA Computer Matching Program to match travel data and participant requests. There are approximately 42,800 employees in the Billings urban area. The average roundtrip to work is six miles. The following assumptions were used to calculate the energy savings:

(1) 1.2 commuters per vehicle in rush hours;
(2) 10 percent of total employees join car pool;
(3) 13 miles per gallon of fuel consumed;
(4) 3 commuters per vehicle in car pool;
(5) 98 percent of the employees in cars.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980 -- Billings Mass Transit

Two methods were used to project the possible energy savings of this Program Measure: *Guidelines for Travel Demand Analysis of Program Measures to Promote Carpools, Vanpools and Public Transportation* and BTU analysis

from data provided by the Billings transportation planners. The first procedure would yield a savings of .061 x 10^{12} BTUs/year, whereas the latter projects a savings of .00673 x 10^{12} BTUs/year. The latter number is the same magnitude as that calculated for the Missoula bus system and is the more conservative figure. Thus, the remaining analysis is based on this projection.

Only the persons served by the bus route were included in the analysis. This included 87,000 persons served with an average of 2.7 persons per household. Assume that 1.1 workers per household yields 35,444 potentially affected workers. The remaining assumptions were used in calculating with FEA guidelines:

(1) Total ridership per day would increase from 1,500 in 1975 to 2,100 in 1980;
(2) The number of bus miles traveled per day to decrease headway would increase from 1,500 miles per day in 1975 to 2,000 miles per day in 1980;
(3) Six mile roundtrip;
(4) 13 miles per gallon per auto;
(5) 8 miles per gallon per diesel bus.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980 -- Missoula Mass Transit

Based on data provided by the Missoula City Planning Office, the bus system implemented by 1980 would have an energy savings of .0065 x 10^{12} BTUs/year. Translated into gallons of gasoline, the system would yield a savings of 51,864 gallons of gasoline.

Based on the number of miles traveled per year by the bus system and the number of persons riding provided by the Missoula City Planning Office, the energy savings was computed. Assumptions included the following:

(1) 447,668 miles traveled per year by bus in 1977;
(2) 24,700 persons used the bus per year in 1977;
(3) The ridership and bus mileage remained constant through 1980;
(4) 13 miles per gallon per auto;
(5) 8 miles per gallon per diesel bus.

Currently it appears that work on this Program Measure is reasonably on schedule. No change is proposed in original estimates of energy savings, a total of .048 trillion BTUs in 1980.

EVALUATION

- Pre- and post-usage surveys in Billings and Missoula areas

MONTANA ENERGY PROGRAM

PROGRAM MEASURE TITLE Car Pool/Van Pool: Increase in Transit Level of Service

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Review current state public transportation programs	Begin		Complete							
2. Develop model car pool/van pool mass transit program for initiation in Montana cities		Begin			Complete					
3. Develop a public awareness program to support public transportation	Begin		Complete	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
4. Evaluate increased usage of car pool/van pool and mass transit by means of a survey										Complete

Table III-12. Program Measure 5

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	20	206	
		(6)	State Agencies
		(100)	Political Subdivisions
		(100)	Public
1979	10	6	
1980	10	6	

Table III-13. Program Measure 5

PART III
BUDGET INFORMATION

STATE Montana

DATE 1/2/78

Table III-14. Program Measure 5

Tasks 2 & 3 will be contracted to private firms

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 2	80.001	$	$	$ 10,000	$ 206,000	$ 216,000
2. Task 3	80.001			10,000	-	10,000
3.						
4.						
5. TOTALS		$	$	$ 20,000	$ 206,000	$ 226,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity (1) Task 2	(2) Task 3	(3)	(4)	Total (5)
a. Personnel 250 man/hrs	$ 9,000	$ 50 man/hrs 2,000	$	$	$ 11,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	1,000	8,000			9,000
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 10,000	$ 10,000	$	$	$ 20,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 5b: BIKEWAY CONSTRUCTION

NARRATIVE STATEMENT

As with many other energy conservation Program Measures, the promotion of bikeways has a dual set of benefits. Not only is bicycling an energy efficient mode of transportation, it is a package of positive externalities. It is less expensive, often more convenient, usually more healthful, and certainly more compatible environmentally than its chief rival -- automobiling. Based on testimony in public hearings throughout Montana's urban areas, it appears that a significantly greater incidence of bicycling would occur if bicycle paths were established to help reduce the hazards of competing with other traffic. Immediate goals in Montana are to develop bikeways in four of the larger urban areas: Miles City, Missoula, Billings and Great Falls. Funding would come from state highway construction funds if the Legislature clarified previous legislation providing that 3/4 of 1 percent of the funds be spent for creation of footpaths and bicycle trails.

OBJECTIVES

- Facilitate efforts by local governments to design and implement bikeway systems by January 1, 1979
- Document successful bikeway programs carried out by local governments to serve as a guide to other local governments by June 1, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

Extensive local energy saving calculations have been performed for potential bikeways in Miles City, Billings, Great Falls and Missoula. The

combined plans are projected to result in over 163,000 fewer vehicle miles per day traveled in these cities. The total savings from implementing bikeways in these four cities is .0032 trillion BTUs. Currently we have no reason to vary from our original estimates for this Program Measure.

EVALUATION

- Public surveys to determine increased usage patterns in 1980

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Bikeway Construction

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Continue current state bikeway construction program	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
2. Document current successful bikeway programs in the U.S.A.			Complete							
3. Assist local governments' bikeway planning programs	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
4. Conduct public surveys in selected areas relating to increased usage of bikeways										Complete

Table III-15. Program Measure 5b

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	-0-	250	
		(200)	State Agencies
		(50)	Political Subdivisions
1979	-0-	250	
1980	-0-	250	

Table III-16. Program Measure 5b

PROGRAM MEASURE 5c: ENFORCEMENT OF 55 M.P.H. SPEED LIMIT

NARRATIVE STATEMENT

Numerous studies have documented well the two-fold advantage of the nationwide 55 mile per hour speed limit: over-all fuel savings and reduction of fatal accidents. Nonetheless, it remains true that penalties for violation have failed to produce uniform compliance with the speed standard. In Montana, a combination of extensive open road and inconsequential fines has produced a substantial percentage of violators. Based on 1977 Montana Highway Department data, 58 percent of vehicles on state highways exceeded the limit; 24 percent exceeded 60 MPH and 8 percent exceeded 65 MPH.

Strict conformance to the 55 mile per hour speed limit could produce significant savings by 1980. It has been shown that automobiles traveling at 60 MPH consume 5 percent more fuel per mile than those traveling at 55 MPH. The corresponding figures for reductions back to 55 MPH are 13 percent for 65 MPH and 20 percent for 70 MPH. Thus, immediate savings are likely since more than half of Montana's drivers would be affected. It should be noted that stricter enforcement of the limit may alter the behavioral pattern of only a portion of the drivers (perhaps two-thirds) and that resentment to the imposition may produce some non-quantifiable costs of compliance. A public information program should focus first upon greater voluntary compliance, especially during the portion of the year when the nation's fuel shortages are dramatized by the winter's cold. However, enforcement can change behavior (i.e., perception of risk in being caught).

OBJECTIVES

- To reduce the 85th percentile speed to 55 MPH by December 31, 1982
- To reduce the 85th percentile speed by 2 MPH on the Interstate System by December 31, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

Approximately 75 percent of the vehicle miles traveled in Montana are on roads with a posted 55 MPH speed limit. Using data supplied by the Montana Highway Department and the Montana Highway Patrol, we calculate that if everyone in the state obeyed the 55 MPH speed limit, 2.83 percent of the energy used in transportation could be saved. In our analysis, we assume that strict enforcement of the 55 MPH speed limit would cause two-thirds of the drivers in Montana to change their behavior and obey the speed limit. This would result in a 1980 projected energy savings of 2.18 trillion BTUs.

EVALUATION

- Public information program implemented
- Reduction in 85th percentile speeds as contained in objectives

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Enforcement of 55 M.P.H. Speed Limit

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop legislative revision relating to speed limits in Montana	Partial Pass					Reintro-duce				
2. Develop and initiate a public awareness program relating to 55 M.P.H. speed limit	Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
3. Conduct an enforcement manpower utilization study relating to practices and manpower needs in enforcing 55 M.P.H. speed limit		Begin		Complete						
4. Initiate enforcement manpower request to legislature						Introduce				
5. Evaluate performance of increased effort (speed limit studies)		Quarterly Monitoring	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

Table III-17. Program Measure 5c

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	55	200	
		(100)	State Agencies
		(100)	Political Subdivisions
1979	50	1,300	
1980	50	1,350	

Table III-18. Program Measure 5c

PART III
BUDGET INFORMATION

STATE Montana

DATE 1/2/78

Table III-19. Program Measure 5c

Task 2 contracted to a private firm
Task 3 contracted to Department of Justice

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 2	80.001	$	$	$ 45,000	$ 45,000	$ 90,000
2. Task 3	80.001			10,000	155,000	165,000
3.						
4.						
5. TOTALS		$	$	$ 55,000	$200,000	$ 255,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 2	(2) Task 3	(3)	(4)	
a. Personnel 175 man/hrs	$ 7,000	$	$	$	$ 7,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	38,000				38,000
f. Contractual 250 man/hrs		10,000			10,000
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 45,000	$ 10,000	$	$	$ 55,000
l. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 6: WEATHERIZATION

NARRATIVE STATEMENT

The federal government's cooperative weatherization program already has proven to be an effective method of reducing heat loss in Montana homes. Approximately 2,000 homes have been upgraded with demonstrated energy savings ranging from 15 to more than 40 percent of previous energy consumption levels (depending on the quality of the existing construction). Still, nearly 30,000 additional low income households in the State are eligible for energy conservation renovations through the program. The State is committed to a significant expansion of the weatherization program in order to reach a substantial number of these homes. The results will be an immediate documentable energy savings together with a needed reduction of the burden of rapidly rising heating costs upon those in Montana who are least able to afford them. The Legislature recognized the importance of this program by passing expansion authority during the 1977 Session. The extensive State commitment is justified further by the availability of federal weatherization funds from the Community Services Administration at a 60 to 40 match ratio and under Title 20 of the Social Security Act, a 3 to 1 match ratio.

The State will utilize $150,000 per year for FY '78 and FY '79 to generate an approximate additional $450,000 per year in federal funds. This commitment amounts to an approximate tripling of the resources of the existing program. Implementation of the program will be done within the existing framework of joint administration by the Department of Community Affairs and the Department of Social and Rehabilitation Services. The combined

federal and state weatherization funds will be allocated to local weatherization programs on both a formula and project basis. One-half of the funds will be disbursed to local programs according to the incidence of eligible households, and the remaining one-half will be allocated on the basis of local matching effort. Yearly allocations will be made, and both the Department of Community Affairs and the Department of Social and Rehabilitation Services will review local program performance prior to approval of subsequent funding requests.

OBJECTIVES

- Passage of legislation providing increased matching funds necessary to expand ongoing weatherization program by April 1, 1977
- Increase interagency coordination to insure mobilization of all available resources for weatherization in an integrated fashion by July 1, 1977
- Maintain and expand efforts to inform potentially eligible Montanans of weatherization program benefits by January 1, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

If the weatherization program is continued through 1980, at least $2.4 million will be made available. Labor funds allocated from other sources (CETA, for example) will increase the value of the weatherization program even further. Local data indicate that weatherization will cost a maximum of $400 per house for an average energy savings of 20 percent. Thus, if we assume that 8,000 homes are weatherized through this program and that each house reduced its energy consumption by 20 percent, 0.29 trillion BTUs will be saved in 1980. We assume that the low income houses

likely to be weatherized are both smaller (1,000 square feet) and less adequately insulated (180,000 BTUs per square foot per year) than the average Montana home.

EVALUATION

- Increased general fund appropriation
- Expanded program operational in 1977
- Evaluation method developed by July 1, 1978

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Weatherization

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop and introduce legislation expanding weatherization program for low income and elderly	Complete									
2. Initiate expanded weatherization program	Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
3. Initiate an evaluation system relating to the weatherization program	Begin		Complete							
4. Improve program coordination among state agencies		Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

Table III-20. Program Measure 6

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	10	600	State Agencies
1979	10	700	
1980	10	800	

Table III-21. Program Measure 6

PART III
BUDGET INFORMATION

STATE Montana

DATE 1/2/78

Table III-22. Program Measure 6

Task 3 contracted to a private firm

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 3	80.001	$	$	$ 10,000	$ 600,000	$ 610,000
2.						
3.						
4.						
5. TOTALS		$	$	$ 10,000	$ 600,000	$ 610,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 3	(2)	(3)	(4)	
a. Personnel 250 man/hrs	$ 10,000	$	$	$	$ 10,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 10,000	$	$	$	$ 10,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 8: RENEWABLE ENERGY TAX CREDIT

NARRATIVE STATEMENT

In recent years, public interest in renewable energy conversion systems has risen dramatically from an attitude of curious amusement to a growing consensus that solar and wind energies will be major energy sources in the future. While belatedly gaining recognition as the long-term solution to our crisis of non-renewable energy dependency, solar energies have not been widely perceived yet as near-term energy supply options. This reluctance to accept one of the next century's primary energy supplies as the decade's reasonable energy option stems from many factors.

The rapid escalation of fossil fuel prices has been in effect for only the last few years, and there remains much confusion over whether these inflationary pressures will persist indefinitely. This same short period of fossil fuel supply constraints and price rises also marks the beginning of serious consideration of renewable energy alternatives. Hence, a widespread unfamiliarity with the technology of their conversion and use exists. There is also the economic condition of the average cost of conventional energy supplies to the consumer being substantially less than the marginal cost to the supplier for providing new units of depletable energy. This dilution of the new cost of energy among the lower priced, on-line supplies delays the impact on the consumer; and it also reduces the apparent cost effectiveness of renewable energy systems which displace the need for depletable energy consumption. Of no small significance is the immature status of this fledgling industry. Cost reductions through larger scales of

production and innovative materials and designs have not yet reached the marketplace. And, finally, our tax system biases the flow of capital by offering investment tax credits, amortized depreciation, depletion allowances, etc., for large-scale corporate efforts to extract, convert and deliver more non-renewable energy, while individual or family investments in durable, value-producing goods (such as a solar water heater or wind generator) are ignored as frivolous consumer purchases.

In recognition of this situation the Montana Legislature passed a tax credit bill during the 1977 Session. The bill allows homeowners to claim a tax credit for installation of non-fossil form of energy generation in the home.

OBJECTIVES

- Passage of legislation providing substantial tax credits to persons installing renewable systems by April 1, 1977
- Develop and distribute public information materials describing the tax benefits available through state and federal codes for installation of energy conservation and renewable resource technology measures by July 1, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

The tax credit will encourage solar hot water heaters. For the purpose of this analysis, we will assume that the average Montana home hot water heater requires 28.7×10^6 BTUs per year. Solar hot water heaters can provide up to 80 percent of the average Montana domestic hot water heating needs at a reasonable cost of about $1,000 per heater. This cost is reduced to $600 per heater by the tax credit. The life cycle cost of the

solar energy used is decreased from $2.95 per million BTUs to $1.77 per million BTUs (about the cost of natural gas now). If we assume a 1 percent per year remodeling rate, 6,400 Montana homes in 1980 will have solar water heaters. This would represent a savings in fossil fuels and electricity of .249 trillion BTUs in 1980 (70 percent fossil fuels, 30 percent electricity plus electricity conversion factor).

It is very likely that many other renewable energy systems will be purchased under this program; however, it is impossible to project exactly what they might be or what energy savings might occur.

It is recognized that the tax credit provisions are not as far reaching or in the magnitude of those originally proposed in previous editions of the plan. However, we have no further basis to alter our original computation of potential energy savings. The assumptions contained in our original projections seem to be quite conservative so we propose no change to our original estimated energy savings of 0.25 trillion BTUs for this Program Measure.

EVALUATION

- Documentation by January 1, 1979, of the impact in increased renewable resource technologies being initiated

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Renewable Energy Tax Credit

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop and introduce legislation relating to tax credit for renewable energy	Complete									
2. Develop state program guidelines		Complete								
3. Prepare insert for the *Montana Renewable Resources Handbook*	Complete									
4. Distribute inserts	Complete									
5. Develop an evaluation methodology				Begin		Complete	Continue	- - - -	- - - -	- - - -

Table III-23. Program Measure 8

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	10	1,020	
		(10)	State Agencies
		(10)	Political Subdivisions
		(1,000 est.)	Public
1979	10	1,120	
1980	10	1,220	

Table III-24. Program Measure 8

PART III
BUDGET INFORMATION

STATE Montana

Table III-25. Program Measure 8

DATE 1/2/78

Task 5 will be contracted to Department of Revenue

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 5	80.001	$	$	$ 10,000	$1,020,000	$1,030,000
2.						
3.						
4.						
5. TOTALS		$	$	$ 10,000	$1,020,000	$1,030,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 5	(2)	(3)	(4)	
a. Personnel 250 man/hrs	$ 10,000	$	$	$	$ 10,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 10,000	$	$	$	$ 10,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 9: PUBLIC UTILITY MEASURES

NARRATIVE STATEMENT

Utility Rate Structure Study

With the exception of fuel used in transportation, the vast majority of energy consumed in Montana is marketed through the fixed utilities which distribute natural gas and electricity. The signals which stimulate consumer decisions on the use of these energy forms are the prices which depend on the rate structure that is approved by the Public Service Commission. It is imperative that the impact of rate schedules on electricity and gas demand be analyzed thoroughly to identify whether the efficient use of energy is encouraged through the regulatory policies of the Commission.

Consumer demand for energy primarily is a function of price; but the effect of price on demand varies with the degree to which a particular demand exceeds those basic energy requirements that must be satisfied irrespective of costs. This variable effect of price on levels of consumption is referred to as the elasticity of demand. Energy needs for physical comfort, hot water, cooking and power for refrigeration and lights are less susceptible to reduction because of price than energy needs would be for additional space heating, illumination, convenience appliances, and other energy consuming goods and services which exceed that irreducible level of minimum energy requirements. The reduction of energy consumption is most likely to occur in those marginal end use categories, particularly if state policy intends to maintain equitable minimum energy supplies for all citizens.

Current utility rates for natural gas and electricity are charged on a declining block schedule in which the per unit price decreases as the level of consumption increases. Historically, as the demands on utilities grew, the costs of supplying electricity or natural gas decreased with larger-scale production and distribution facilities. This trend has been reversed in recent years, and it is clear that increased energy supplies will cost substantially more at the margin than the costs of on-line supplies. In Montana, this escalation of new energy supply prices is particularly apparent since the predominant role of hydroelectric generation is being superseded by coal-fired generation capacity; and new natural gas prices continue their steep rise above cost levels that were in effect only two years ago.

With the costs of supplying consumer demands for natural gas and electricity escalating, the appropriateness of declining block rates which promote additional consumption must be evaluated as to it implications for conserving energy and equitably allocating costs among customers according to the utility costs of serving their particular needs. The Montana Consumer Counsel recently granted funds to assist the Montana Power Company in conducting a load characteristic study of randomly selected residential, commercial and industrial customers. By monitoring these customers' demands for electricity as a function of time, the utility company will be able to identify the contributions each customer class makes to the system's energy supply and demand capacity requirements.

It is recommended that this study be augmented with a simultaneous one-year analysis of the operations of the Montana Power Company (and other

major utilities if funds permit) to determine the utility's real costs of providing electric power to all customer classes. Without an accurate assessment of capital and operational costs of providing electric power, the validity of the current rate structure in relation to customer load characteristics cannot be determined fully.

The significant issue of integrating renewable energy conversion systems (solar heating equipment or wind electric generators) with utility networks also should be addressed by this customer load study. There are a limited but growing number of buildings in Montana that are solar heated. We recommend that a select number of these buildings be incorporated into the load study to identify the characteristics of their auxiliary energy demands and to determine how their heat storage capabilities can be used for electric load management purposes.

After one full year's analysis of utility costs of service and customer class load characteristics, the Consumer Counsel and the Public Service Commission should determine whether the existing rate schedules accurately charge just and reasonable rates to customers according to their responsibility for electric service costs incurred for their benefit. This assessment also should consider the long-run marginal cost of service for continued expansion of the utility system. With the completion of this review, the Public Service Commission should recommend an electric utility rate schedule which may reflect more accurately the true costs of service and which will support the conservation of depletable energy resources.

Encouraging Industrial Co-generation of Process Heat and Electricity

Many of Montana's energy intensive industries consume huge quantities of natural gas for producing process heat and steam necessary for their operations. There are promising opportunities for process steam to be applied to generate electric power in addition to supplying heat and mechanical power. A National Science Foundation study estimates that current industrial co-generation represents only 5 percent of the total capability for implementing this dual purpose energy use in the United States. That same study estimated that the Hoerner-Waldorf paper mill in Missoula has a capability to generate 35 megawatts of electricity in conjunction with its ongoing operations; and the oil refinery complex in Billings represents another major prospect for co-generated electricity.

Since the mechanical and thermal energy of the steam used for industrial generation of electricity is applied subsequently to other industrial processes, the total end use efficiency of the raw source energy is substantially higher than those conversion efficiencies characteristic of central electric generating stations. By implementing conversion technologies which increase end use efficiencies, industrial co-generation can accomplish multiple purposes with a given amount of fuel, thus avoiding the need for redundant and thermodynamically less efficient electric generation capacity in the utility system.

With thorough auditing of each industry's energy consumption and specific energy requirements, the technical feasibility of co-generation can be determined for specific facilities or processes. The existing utility rate schedules for industrial users provide electric power at costs far below

the average cost to residential and commercial users and even farther below the marginal costs of new electric power capacity. As utility rates are evaluated and possibly revised, the economic feasibility of industrial co-generation also may be enhanced as the most cost effective investments in power supply are identified.

We recommend that the Public Service Commission analyze the potential for industrial co-generation as determined from the detailed energy audits to be submitted in compliance with the State's emergency energy allocation plan. The Commission also should assess whether the Electric Supplier's Territorial Integrity Act of 1971 (R.C.M. 70-501) prohibits industrial or commercial co-generation of electric power. This law provides that ". . . an electric utility shall have the right to furnish electric service to any industrial or commercial premises if the estimated connected load for full plant operation at such . . . premises will be 400 kilowatts or larger within two years from the date of initial service . . ." (R.C.M. 70-503(3)).

A final issue deserving the Commission's attention is whether existing electric utilities should be required to enter into purchased power contracts with those industries whose co-generation capabilities exceed their own private electric requirements. In those cases where the co-generated electricity is reliably available at a cost less than what the utility company could provide from its own facilities, the utility should show cause why it would refuse a co-generated electric sales offer. In lieu of this requirement, the designation of common carrier status for fixed energy utilities should be reviewed for its impact on improving the marketability of electric power generated by industry within Montana.

Energy Audits of Large Commercial and Industrial Utility Customers

On May 30, 1975, the Montana Public Service Commission exercised its emergency rule-making authority by ordering natural gas utilities to prepare (in conjunction with major industrial and commercial gas users) energy conservation plans for improving the efficiency of energy usage by those large customers. If a utility customer did not file an emergency conservation plan by a specific date or if their plan was deemed insufficient by the Commission, the Commission then could impose a monthly penalty curtailment of natural gas up to 10 percent of the amount used by the offending customer during the same month of the previous year. A hearing was held on this emergency rule in September of 1975, adopted by the Commission in December of 1975, to be effective on January 3, 1976.

The need for an accurate audit of how natural gas and electricity are used by large industrial and commercial customers was more pronounced in 1977 than it was in 1975. Significant curtailments of industrial interruptible gas supplies are forecasted for the immediate future, and there are indications that the Bonneville Power Administration may begin to reduce electric power sales to large industrial customers in Northwest Montana. With the severe weather conditions in the Eastern United States and federal considerations of emergency allocation of interstate natural gas supplies, Montana is preparing a comprehensive emergency energy conservation plan which would minimize the economic disruptions of a statewide or national energy emergency.

The Montana Energy Office has requested all utility companies and 250 major industrial and commercial customers to conduct an energy audit

update and report that information on a standardized form by September 1, 1977. These energy audits will be analyzed by the State and data derived used for determining energy conservation plan activities.

OBJECTIVES

- To conduct energy audits of major industrial and commercial sectors beginning in 1977
- Through executive order, establish energy conservation contingency plans based upon audits carried out by large industrial and commercial consumers designed to minimize economic disruptions resulting from curtailments in supply
- Assist Public Service Commission and the Department of Natural Resources and Conservation to obtain funding to carry out a feasibility study on the potential of utilizing excess process steam to produce electricity by July 1, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

The energy savings expected under some of the individual programs in this Program Measure are speculative. An energy conservation rate structure that would be effective in calendar year 1980 will save energy as will industrial co-generation of electricity and process steam. Unfortunately, savings cannot be precisely quantified until the actual rate structure is determined and specific co-generation projects are announced. Thus, for the purposes of the Energy Policy and Conservation Act, we claim no specific calendar year 1980 savings for these programs.

In addition, the required industrial and large commercial energy audits will disclose areas in which energy can be saved in a cost effective manner. These expected savings can be quantified. It has been shown on a

national basis that the implementation of detailed industrial and large commercial energy auditing programs will result in energy savings in the range of 5 to 10 percent of total energy consumption, with specific examples of savings as high as 20 percent. It is conservatively assumed that this mandatory energy auditing requirement will result in a 7 percent reduction in Montana industrial energy consumption in 1980. If we conservatively project that 1980 industrial energy consumption will remain at the 1975 levels reported by Terry Wheeling in *Montana Historical Energy Statistics*, the resultant savings will be 6.99 trillion BTUs in 1980.

The auditing requirement also will apply to large commercial customers; however, since many large commercial customers are included in the government sector and will be subject to state government energy auditing programs, we do not report any commercial energy savings here to avoid "double counting" errors. Since no commerical auditing savings are claimed, commercial energy savings under educational programs in Program Measure 10 will be counted.

Currently, efforts to conduct the rate studies proposed under this Program Measure have met with some frustration. We are not yet willing to say that it can't be done but we have not found an acceptable way to do it at this time. We will continue our efforts toward this end.

The energy savings projected for this Program Measure relate to savings from industrial and large commercial users. Our efforts to impact this area are progressing favorably and we will continue to pursue this target group.

No change in estimated energy savings is proposed.

EVALUATION

- Completion of assigned tasks

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Public Utility Measures

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop an energy audit concept in the industrial and large commercial sector	Complete									
2. Initiate energy review program	Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
3. Provide technical assistance to seek co-generation study		Begin	Complete							
4. Conduct co-generation study if feasible				Begin		Complete				
5. Develop and introduce legislation regarding co-generation						Complete				

Table III-26. Program Measure 9

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	-0-	125	
		(100)	State Agencies
		(25)	Public
1979	10	150	
1980	10	150	

Table III-27. Program Measure 9

INTRODUCTION TO PROGRAM MEASURES 10, 10a, & 11

FEA states that the Energy Conservation Education, the Public Education - Energy Audit Subprogram, and the Energy Audit Program Measures are to be treated separately. A more logical approach, at least for Montana, is to consider the activities as parts of a single program designed to impact one of the more serious problem areas we can detect; i.e., the public's attitude toward the saving of energy in the place of business or residence.

No one of these Program Measures can stand alone. The Energy Audit program we are pursuing will not be effective without public education as to its worth. The Energy Conservation Education program could be in jeopardy unless we can show the public how it affects them in their life-style. This is especially true when one considers the funds available to accomplish the objectives of the over-all program. Success or failure of these Program Measures will depend to a large extent on public attitude and initiative.

Given this perspective, we find the projected energy savings goal contained in the FEA September 1, 1977, letter to be unacceptable. Our original estimate of 4.29 trillion BTUs savings for the Energy Conservation Education Program Measure was a conservative estimate recognizing the problems associated with a voluntary effort. Our Supplemental Plan containing our methodology for the Energy Audit and Public Education Energy Audit Subprogram Measures did not suggest further energy savings because we recognized the symbiotic relationship that must, and does, exist between

these Program Measures. In addition, any attempt to distribute the total among the three Program Measures appears to us to enhance the opportunity of counting a savings more than once.

For these reasons we conclude that the original estimate of energy savings of 4.29 trillion BTUs is reasonable and have shown this savings attributable to the three Program Measures combined.

PROGRAM MEASURE 10: ENERGY CONSERVATION EDUCATION

NARRATIVE STATEMENT

Commitment to a coordinated program of public education in energy conservation may prove to be the most effective method of saving energy, especially in the long run. Thus, education is central to our plan. The following reasons are offered for placing high priority on educational measures:

(1) Since self-interest is a powerful individual motive, education can promote awareness of energy savings choices which are free from negative impacts;

(2) Voluntary compliance is the most acceptable form of behavioral modification in a democracy, and bureaucratic costs are minimized in an educational program;

(3) Energy conservation is a positive and popular ethic (shared by many social groupings in Montana) which can be expressed in a comprehensive education program; existing programs and resources can be integrated to achieve maximum effects;

(4) Proven energy saving methods exist for every energy consuming sector of our society simply waiting to be communicated to people; there also is likely to be significant spillover or demonstration effects from sector to sector.

The greatest value will result from an educational program which involves and orchestrates the activities within all major mediums of communication including schools, vocational and adult education, university system outreach, distribution of pamphlets and other materials, print and broadcast channels, demonstration projects, community display programs. This Program Measure has three components which address the need:

(1) Confirmation and expansion of existing programs centered in one or more of these mediums;

(2) Promotion and support of new and innovative programs for mediums previously lacking attention;

(3) Provision of a state organizational framework for the continuing coordination of public and private education efforts in all mediums.

While significant efforts must be made in the direction of creating innovative programs, it is equally important to sustain and coordinate a wide variety of existing private and public programs addressing many facets of the energy conservation problem. The Montana Energy Office can provide strong leadership in the cultivation of a shared public conservation consciousness by promoting and assisting the efforts of programs such as the following:

(1) Human Resources Development Councils in 11 areas of the State: The councils provide practical energy conservation and renewable energy information and administer the statewide weatherization program.

(2) Montana University System: The universities and colleges of the State provide a tremendous reservoir of talent and information on energy systems, energy conservation and renewable energy.

(3) Citizen groups: Various citizen groups such as the League of Women Voters, American Association of University Women, the Alternative Energy Resources Organization (AERO), the Environmental Information Center, and numerous others, are sources of information on energy conservation. The activities of these groups should be encouraged since they provide "grass roots" contact with the citizens of the State.

(4) Utility company advertising: The various utility companies in the State currently are advertising the benefits of energy conservation. The

continuation and expansion of this program will account for measurable energy savings.

(5) Adult education programs.

It is also expected that the Montana Energy Office will provide long-range leadership in the stimulation of new ideas in energy conservation. In addition to dispensing available monies for research in this area, the office itself should be the source of new ideas and assume responsibility for their formulation into policy initiatives.

OBJECTIVES

Establish an ongoing planning/implementation process involving local, state, private and public organizations and agencies with capabilities in and commitment to energy conservation education by March 1, 1978

Inaugurate an energy conservation media development and information resource service unit to supply the needs of the various agencies and organizations engaged in energy conservation education efforts by July 1, 1978

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

Energy conservation education is disbursed throughout all of the program measures. Since it is impossible to separate out the savings for energy conservation education by itself, no savings are estimated for this measure.

PROGRAMS BY SECTOR	MEDIUM	EXPECTED SAVINGS
Residential		
Insulation and Temperature Modification	Schools, Pamphlets, Prints & Broadcasts	Immediate
Publicity on Tax Incentive, Loan & Weatherization Programs	Schools, Pamphlets, Prints & Broadcasts	Immediate
Publicity on Alternative Energy Generation	Demonstration Projects, Community Display	Intermediate
Commercial		
Same as Residential		
Competitive Energy Savings Demonstration Projects	Demonstration Projects	Intermediate
Life Cycle Costing	Pamphlets, Demonstration Projects	Intermediate
Industrial		
Energy Auditing	Pamphlets, Workshops	Intermediate
Systems Energy Management	Pamphlets, Workshops, Training	Immediate
Co-generation	Pamphlets, Workshops	Long-Range
Transportation		
Driver Training, Operation, Maintenance	Schools, Vocational Co-op Extension	Immediate

(Continued)

Table III-28. Examples of Energy Conservation Education Programs

PROGRAM BY SECTOR	MEDIUM	EXPECTED SAVINGS
Transportation (Continued)		
Energy Efficient Auto Purchases	Multiple, Pamphlets	Immediate
Car Pooling Promotion	Multiple, Demonstration Projects	Immediate
Alternative Transport, Bicycles, Pedestrian	Multiple, Pamphlets	Immediate
Mass Transit	Multiple, Demonstration Projects	Intermediate
Agriculture		
Cropping and Fallowing	Co-op Extension, Pamphlets, Demonstration	Immediate
Natural Fertilizing	Co-op Extension, Pamphlets, Demonstration	Immediate
Biomass Conversion	Co-op Extension, Pamphlets, Demonstration	Intermediate
Wind Power	Co-op Extension, Pamphlets, Demonstration	Intermediate
Government		
Agency Training	Workshops, Pamphlets, Demonstration Projects	Immediate
Intergovernmental Transfers	Workshops, Pamphlets, Demonstration Projects	Immediate
Private Activity Transfers	Demonstration Projects Pamphlets, Prints & Broadcast Media	Intermediate
"Model" Renewable Energy Demonstration Projects	Demonstration Project	Intermediate to Long-Range

Table III-28. (Conclusion)

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Energy Conservation Education									
SKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
Develop and introduce legislation regarding focal point of energy management (see Supplementary Plan)	Complete									
Develop an inventory of all current public education efforts in energy conservation	Begin	Complete	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
Develop and implement public education program relating to the Program Measures 1-9		Begin			Complete	Continue	- - - -	- - - -	- - - -	- - - -
Evaluate specific aspects of public education Program Measure (pre- and post- public surveys)		Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
Revise and update public education Program Measure as required						Revise				

Table III-29. Program Measure 10

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	65	250	Public
1979	70	300	
1980	80	350	

Table III-30. Program Measure 10

PART III
BUDGET INFORMATION

STATE Montana

Table III-31. Program Measure 10

DATE 1/2/78

Task 3 will be contracted to the universities and private firms
Task 4 will be contracted to Montana State University

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE*** (f)	Total (g)
1. Task 3	80.001	$	$	$ 60,000	$ 245,000	$ 305,000
2. Task 4	80.001			5,000	5,000	10,000
3.						
4.						
5 TOTALS		$	$	$ 65,000	$ 250,000	$ 315,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 3	(2) Task 4	(3)	(4)	
a. Personnel 200 man/hrs	$ 8,000	$ 50 man/hrs 1,000	$	$	$ 9,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	52,000	4,000			56,000
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 60,000	$ 5,000	$	$	$ 65,000
l. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

SUPPLEMENTAL PLAN MEASURES

PROGRAM MEASURE 10a: PUBLIC EDUCATION - ENERGY AUDIT

NARRATIVE STATEMENT

The Public Education Program Measure will consist of two primary parts. The first part will be established as an awareness campaign regarding the potential for savings that exists both financially and in energy savings if one chooses to act in the areas of electrical use and space and water heating. We feel it is important to note that we intend to conduct surveys to document current attitude and knowledge before designing content of this effort. Principal target audiences in this part will be the residential and commercial sector. This effort will be implemented six months after the grant award.

The second part of the public education program will consist of an effort to promote the energy audit measure. The promotion is envisioned to be a broad-based media effort consisting of public service announcements encouraging energy audits and information regarding the availability of technical information, workbooks, etc. Clear, concise guidance will be provided for points of contact, including a telephone number.

OBJECTIVES AND MANAGEMENT PLAN

- To increase the awareness and support of the public in the energy conservation program
- To improve the potential for public decision making by increased educational programs relating to energy audits and their potential to guide change

Based on the original research for our SECP and a review and

discussion with existing organizations interested in, or responsible for, energy conservation or conversions, our preliminary decision is to further develop an approach for the small energy consumers in the residential and commercial sectors who consume approximately 30 percent of our energy supplies. Our discussions with existing organizations determined a need for a statewide program. In designing a program around our consumption characteristics, we developed the statewide component to (1) reach the largest populations of small energy consumers throughout the State, and (2) to focus precisely on achieving the objectives of reduced energy consumption, conversion to renewable energy resources and creating positive consumer changes in knowledge, attitude and behavior as projected in our state energy plan.

Our selection of specific audiences will be more formally developed in the first quarter of the grant period. Tentatively, it includes focusing on upper and middle income and lower income households in single family residences (including mobile homes). In addition, small businesses which are major consumers of energy will be reviewed for further in-depth analysis. The latter classes of consumers will be selected in the initial quarter of the grant period.

Publicity will be statewide in the major newspapers and will specify the program foci of statewide information and referral or assistance services. Additionally, existing organizations will contact their constituencies or clients to provide further information. Information will be supplied to trade publications, weekly newspapers and other general circulation media. Television and radio "spots" will be utilized. The services of the Montana Extension Service will be reviewed for these methods and others, including

university-produced TV or radio publicities or publications. Efforts to publicize the energy program with lending institutions, material dealers, contractors, homebuilders, realtors, energy suppliers, local weatherization and winterization programs and various consumer groups (elderly, low income, minority, handicapped, etc.) will be made. Arrangements will be made by memorandums of understanding or contracts for both this continuing publicity and subsequent distribution of results, case studies and other program features.

We will establish a publications review system to collect, assimilate and assess available information on energy techniques and technologies; services offered by other public, private and governmental agencies; delivery mechanisms used in other programs; technical support or assistance provided in other programs; and then will attempt to organize this information in some form of energy conservation and conversion reference system. Our interest will be to sort out particularly competent principles, techniques, methodologies in energy use measurements; efficiencies of conservation or conversion measures, and, where possible, relative costs; and to develop referral information and packets comprised of the "more useful and comprehendible" publications or information documents, the program will devise a similar review system with existing organizations.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

No savings beyond those approved in Montana's State Energy Conservation Plan are being proposed at this time. Obviously, public education programs do not in themselves directly effect a reduction in energy

consumption. Only action by the energy user can bring about the savings.

We are proposing a number of steps in our efforts in this Program Measure to carefully define public attitude and knowledge, develop an educational program building upon those known levels, and finally a good evaluation scheme to determine changes in attitude and knowledge and, to some degree, behavior changes and the reasons for change. See also the Introduction to Program Measures 10, 10a, & 11.

EVALUATION

- Measurement of change in public attitude and knowledge

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Public Education - Energy Audit

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop an inventory of all current public education efforts		Continue - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - - -
2. Determine the extent of public attitude relating to the need for energy conservation										
A. Develop a survey instrument										
B. Set sample size and test										
C. Conduct survey										
D. Analyze survey	Complete									
3. Determine the extent of public knowledge on how to conserve										
A. Develop survey instrument										
B. Set sample size and test										
C. Conduct survey										
D. Analyze survey	Complete									

Table III-32. Program Measure 10a (Page 1 of 3)

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Public Education - Energy Audit (Continued)									
TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
4. Develop a public education program plan specific to energy audit Program Measure stressing intergovernmental coordination										
A. Define desired knowledge and attitude levels	Complete									
B. Document planned efforts of all parties	Complete									
C. Coordinate the development of program content	Complete									
D. Select target audiences	Complete									
E. Define dissemination methods	Complete									
5. Develop priority public education programs relative to energy audits	Complete									
A. Content										
B. Define costs										
C. Scope										
6. Implement priority public education program covering (a) need for audits, (b) availability of audits, (c) technical material		Begin	Implement	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

Table III-32. Program Measure 10a (Page 2 of 3)

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Public Education - Energy Audit (Continued)									
TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
7. Evaluate changes in public knowledge and attitudes					Complete	Continue	- - - -	- - - -	- - - -	- - - - -
8. Revise and update educational program					Begin	Complete				
9. Develop an "Energy Saver" recognition system		Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - - -
10. Conduct final evaluations										Complete

Table III-32. Program Measure 10a (Page 3 of 3)

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	45	45	
		(20)	State Agencies
		(10)	Political Subdivisions
		(15)	Public
1979	40	50	
1980	40	50	

Table III-33. Program Measure 10a

PART III
BUDGET INFORMATION

STATE Montana

DATE 1/2/78

Table III-34. Program Measure 10a

Task 6 will be contracted to private firms and universities
Task 7 will be contracted to a university

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 6	80.003	$	$	$ 40,000	$ 40,000	$ 80,000
2. Task 7	80.003			5,000	5,000	10,000
3.						
4.						
5. TOTALS		$	$	$ 45,000	$ 45,000	$ 90,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 6	(2) Task 7	(3)	(4)	
a. Personnel 200 man/hrs	$ 8,000	$ 50 man/hrs 1,000	$	$	$ 9,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	32,000	4,000			36,000
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 40,000	$ 5,000	$	$	$ 45,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385. Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 11: ENERGY AUDIT

NARRATIVE STATEMENT

A part of the Energy Audit Program Measure will consist of an effort to encourage Class B energy audit services for residential, commercial and industrial buildings statewide. These will be provided free of charge to individuals requesting them, along with a publication list of technical information available. This effort would be ready for implementation six months after federal financial assistance is received.

A second effort will consist of Class A energy audits being coordinated for all office buildings, educational institutions and hospitals in Lewis and Clark County as a concentrated effort for demonstration purposes.

OBJECTIVES AND MANAGEMENT PLAN

- To enhance the chances of Montana achieving its projected energy savings in the year 1980 by substantially increasing the effective use of energy audits

A statewide focus is selected to test the proposition of developing our plan which uses existing organizations, intergovernmental coordination and attempts to reach the broadest representation of energy consumers. It also allows for broader participation by various organizations and individuals to reach the objectives incorporated in the program. The method utilizes contact and referrals of existing organizations who will process self-conducted audits and assistance requests, provide technique and technology check lists, referrals to private industry sectors and objective public information or analysis. In addition, general and specific

information will be provided by these organizations, such as material listings.

Following is a brief list of those organizations envisioned to be principal participants in the program:

Association of Counties
League of Cities and Towns
Lieutenant Governor's Office
Cooperative Extension Service
Department of Community Affairs
    Human Resources Division
    Housing Division
Board of Housing
Department of Natural Resources and Conservation
Department of Agriculture
Superintendent of Public Instruction
Department of Institutions
Department of Social and Rehabilitation Services
Alternative Energy Resources Organization
Montana Energy and MHD Research and Development Institute
National Center for Appropriate Technology
Trade Associations
Labor Unions
Contractors

One main feature of the program is to secure adequate feedback from consumers assisted in the program, specifically their experiences with institutional barriers (public, financial, supply or others) and consumer acceptance. The latter concern is an attempt to obtain consumer feedback or acceptance and satisfaction in the assistance provided in the program, the efficiencies of the physical improvements or changes, and the problems encountered in these (burdensome costs, lack of technically trained personnel in making improvements or changes, etc.) The statewide program, though managed by the Lieutenant Governor's Office, is largely dependent on the feedback mechanisms established to handle the information and assistance services they will provide.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

From worksheets available in the Montana Energy Office that were developed by MERDI, it is estimated that the Home Energy Savers Program will save 1.7053 trillion BTUs by 1980. In addition, energy savings from energy audits in existing buildings will amount to an estimated 1.7434 trillion BTUs. The total estimated energy savings for this measure is therefore 3.45 trillion BTUs in 1980.

EVALUATION

- Audits requested
- Audits returned
- Improvements made

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Energy Audit

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Develop a detailed work plan for energy audit program coordination	Begin	Complete			Update				Update	Update
2. Develop three classes of energy audits (format & content)	Begin	Complete								
A. Develop										
B. Test										
C. Review										
D. Finalize										
3. Develop an analytical process for each class of energy audit	Begin		Complete							
A. Develop										
B. Test										
C. Review										
D. Finalize										
4. Develop a standard evaluation methodology for use in evaluating energy audit impact	Begin	Complete								
5. Develop an energy audit procedure manual for each class of energy audit	Begin	Complete								

Table III-35. Program Measure 11 (Page 1 of 2)

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Energy Audit (Continued)									
TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
6. Develop a public education program		Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
7. Implement Class B energy audit program statewide on request to all respondents		Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
8. Provide and analyze Class B energy audits for schools and commercial sector priorities			Begin		Complete					
9. Provide Class A energy audits in Lewis and Clark County for all office buildings, educational institutions and hospitals				Begin	Continue	- - - -	- - - -	- - - -	- - - -	Complete
10. Evaluate over-all program measure impact										Complete

Table III-35. Program Measure 11 (Page 2 of 2)

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	120	260	
		(50)	State Agencies
		(50)	Political Subdivisions
		(160)	Public
1979	150	200	
1980	150	250	

Table III-36. Program Measure 11

PART III
BUDGET INFORMATION

STATE Montana

Table III-37. Program Measure 11

DATE 1/2/78

Tasks 1-4 will be contracted with public agencies and private firms

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 1	80.003	$	$	$ 5,000	$ 5,000	$ 10,000
2. Task 2	80.003			10,000	10,000	20,000
3. Task 3	80.003			10,000	10,000	20,000
4. Task 4	80.003			5,000	5,000	10,000
5. TOTALS		$	$	$	$	$

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Task 1	(2) Task 2	(3) Task 3	(4) Task 4	
a. Personnel 650 man/hrs	$ 5,000	$ 8,000	$ 8,000	$ 5,000	$
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies		2,000	1,000		
f. Contractual					
g. Construction					
h. Other Data Process			1,000		
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 5,000	$ 10,000	$ 10,000	$ 5,000	$
l. Program Income	$	$	$	$	$

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385. Non-DOE funds refer to all other funds including other authorized DOE funds.

Continued

Table III-37 (Continued). Program Measure 11

Task 7 will be conducted by the MEO
Task 8 will be contracted to State government
Task 9 will be contracted to local government

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Task 7	80.003	$	$	$ 60,000	$ 60,000	$ 120,000
2. Task 8	80.003			20,000	120,000	140,000
3. Task 9	80.003			10,000	50,000	60,000
4.						
5. TOTALS All pages		$	$	$ 120,000	$260,000	$ 380,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				All pages Total
	(1) Task 7	(2) Task 8	(3) Task 9	(4)	(5)
a. Personnel	$	$	$ 10,000	$	$ 36,000
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	40,000				43,000
f. Contractual					
g. Construction					
h. Other Data Process	20,000	20,000			41,000
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 60,000	$ 20,000	$ 10,000	$	$ 120,000
l. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385. Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 12: PROGRAM ADMINISTRATION - COORDINATION

NARRATIVE STATEMENT

The Program Administration - Coordination Program Measure emphasizes those efforts felt to be essential to insure a coordinated approach toward energy conservation in the State of Montana. The varied efforts relate directly to a realization of the need to draw together the diverse statewide activities. This managed approach is felt to be invaluable in insuring that a long-term, stable and thoroughly professional program can be developed and maintained. Our approach or concept is oriented towards managing the results of the energy conservation program; namely, to reduce energy consumption. We clearly recognize that we must assume a persuasive leadership coordinative role, through planning evaluative and informational services.

OBJECTIVES AND MANAGEMENT PLAN

- To develop and implement an energy program balance that will produce the desired impacts on the energy problem, within six months of grant approval
- To produce those impacts in a cost effective manner
- To provide management and the public with information necessary to make intelligent decisions
- To plan and implement a program which includes all available resources

The Montana Energy Office will develop formal coordination arrangements with the existing organizations for audience and geographic coverage, energy techniques and technologies, services and delivery mechanisms, technical support and publication reviews, management and evaluations and consumer feedback on barriers, acceptances and technological needs. For the statewide

program, the MEO will rely heavily on existing organizations to design and implement a coordination effort that includes timely and accurate feedback to the Lieutenant Governor's Office. Central coordination and management for the energy program will be maintained in the Lieutenant Governor's Office. Through Governor's executive orders and a request for a designated state agency employee as the contact for energy conservation or conversion interests, and through interagency memorandums or contracts, the program will be coordinated at the state level. Informal and formal coordination between the Executive and Legislative Branches will be devised and implemented by the Lieutenant Governor's Office, with the Governor's concurrence. Local government coordination will be provided by the Departments of Community Affairs and Natural Resources and Conservation. Formal and informal liaisons and coordination with the University System's institutions will be devised and implemented by the Lieutenant Governor's Office through the state's University System. Local public school coordination will be devised and implemented by the Lieutenant Governor's Office through the state's Superintendent of Public Instruction to the local school districts and schools. Direct liaisons with those participating in the program will be arranged by the Lieutenant Governor's Office.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

Although no additional energy savings are being projected for the Program Administrtion - Coordination Measure, we feel that the benefits in the long term are highly significant. Principally, that significance is realized when one appreciates the true role program management can serve in

the energy programs. Although, obviously, the many interrelated pieces of the total energy program will never be all located in one agency of government, the concept of program management still allows a lead office such as the Montana Energy Office to accept over-all program responsibility and the coordination of those varied program activities. The need for this approach is recognized and earnestly accepted.

EVALUATION

- Eventual success in reducing projected energy consumption in the State of Montana by December 31, 1980

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Program Administration - Coordination

TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980
1. Continue current grant management activities	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
2. Continue technical support services	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
3. Continue state, local, federal government liaisons	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
4. Continue financial reporting and auditing activities	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
5. Continue project monitoring activities	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
6. Continue advisory council activities	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
7. Develop and implement an annual work program by Program Measure	Complete	Implement			Revise				Revise	Revise
8. Update multi-year plan	Complete			Revise	Complete					Update
9. Develop and coordinate legislative proposals				Begin					Complete	

Table III-38. Program Measure 12 (Page 1 of 2)

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Program Administration - Coordination (Continued)										
TASKS & MILESTONES	1977	Calendar 1978				Calendar 1979				1980	
10. Develop and construct program data needs system	Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
11. Develop an over-all program evaluation design and methodology	Begin	Continue	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
12. Establish selected energy program management seminars and workshops for advisory council, and coordinating agencies in the public and private sector	Begin		Complete	Continue	- - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
13. Develop and maintain a comprehensive resource and technical information source	Begin	Maintain	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
14. Evaluate program	Review	Continue	- - - -	- - - -	Complete				Complete	Complete	

Table III-38. Program Measure 12 (Page 2 of 2)

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	47	25	
		(10)	State Agencies
		(10)	Political Subdivisions
		(5)	Public
1979	40	25	
1980	40	25	

Table III-39. Program Measure 12

PART III
BUDGET INFORMATION

STATE Montana

DATE 1/2/78

Table III-40. Program Measure 12

Tasks 1-13 will be conducted by the MEO
Task 8 will be contracted to a State agency

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Tasks 1-13	80.003	$	$	$ 37,139	$ 25,000	$ 62,139
2. Task 8	80.003			10,000	-	10,000
3.						
4.						
5. TOTALS		$	$	$ 47,139	$ 25,000	$ 72,139

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity (1) Tasks 1-13	(2) Task 8	(3)	(4)	Total (5)
a. Personnel 20 man/mo.	$ 20,560	$ 8,500 210 man/hrs.	$	$	$ 29,060
b. Fringe Benefits	2,878				2,878
c. Travel	5,750				5,750
d. Equipment	900				900
e. Supplies	2,500	1,500			4,000
f. Contractual					
g. Construction					
h. Other	4,551				4,551
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 37,139	$ 10,000	$	$	$ 47,139
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM MEASURE 13: ENERGY CONSERVATION DATA BASE

NARRATIVE STATEMENT

During attempts to implement previous editions of this plan and our current review of progress, we found that one of the most glaring deficiencies in our program was lack of a reliable and timely data base concerning energy consumption for specific groups of users. Virtually all of the information available pertains to total consumption of various types of sources or for broad groups of users. The information compiled by Terry Wheeling in *Montana Historical Energy Statistics* (1976) has proven to be quite helpful in guiding our decision process.

However, it is quite obvious that much more needs to be done. The information currently available is sufficient to guide the decision process toward broad range priorities among sector involvements. For example, when given a choice between implementing programs directed toward the industrial or agricultural production sectors, one generally would lean toward the industrial program because of the larger potential for savings. However, the choices among implementation strategies in the industrial sector are not as obvious. Without reliable information on types of use, size and configuration of buildings and other factors, hard decisions as to which strategy will produce the best payoff are difficult if not impossible to reach.

To counteract this problem, we plan to develop a data base that will lead us toward an energy information system for the State. It appears that the most appropriate strategy to follow in accomplishing the purpose of this Program Measure is to collect data for each of the consumption sectors described in Chapter IV, Sector Implementation Plan.

OBJECTIVES AND MANAGEMENT PLAN

- To update, at least annually, the energy statistics contained in the publication, *Montana Historical Energy Statistics* (Wheeling, 1976)
- To complete development and implementation of the automated analysis packages for public schools and state owned and leased buildings
- To implement reporting requirements in energy conservation projects toward obtaining financial and performance information on programs and projects

The consumption information contained in the report on *Montana Historical Energy Statistics* (Wheeling, 1976) published by the Montana Energy Advisory Council establishes an excellent base against which current findings can be compared. We are currently in the process of updating this report to include more current data. This update is being done by MEO staff and should give us a broad overview of consumption patterns during the past two years.

The Sector Implementation Plan (Chapter IV) and the Evaluation Plan (Chapter V) contain a discussion of the purposes and need for evaluating the progress of implementation of activities. Each of the Program Measures (Chapter III) define performance criteria for evaluation. We propose to collect data on each of these performance criteria.

We are currently automating energy audit and management information for public schools and state governmental buildings. We also have found a potential source of consumption data on vehicles through the Montana motor pool. As we continue our efforts to coordinate energy conservation programs in the state we will remain alert to other sources of similar information.

For example, the automated system we are working on for state buildings should also be useful in analyzing consumption data from local governmental buildings and some commercial office buildings.

In Program Measure 12 we discussed the need to develop program coordination, evaluation and accounting systems to assist in effectively managing the Montana Energy Conservation Program. A crucial part of these systems is the collection of data related to each function. To achieve this objective we will include a reporting requirement in any contracts we enter into with state and local agencies. The reporting requirements will include financial data as well as performance data.

ESTIMATED ENERGY SAVINGS FOR CALENDAR YEAR 1980

No direct savings are anticipated.

EVALUATION

- Accurate and timely data to evaluate and manage the Montana Energy Conservation Program

MONTANA ENERGY PROGRAM	PROGRAM MEASURE TITLE Energy Conservation Data Base															
TASKS & MILESTONES	1977	Calendar 1978								Calendar 1979						1980
1. Develop a data needs profile for each Program Measure	Begin	Complete														
2. Finalize data collection procedures for each Program Measure	Begin	Complete														
3. Implement program measure data elements on a priority schedule		Begin				Complete				Continue	- - - -	- - - -	- - - -	- - - -	- - - -	

Table III-41. Program Measure 13

ESTIMATED COSTS OF IMPLEMENTATION (000's)

	DOE	Non-DOE	Non-DOE Contributor
	$	$	
1978	15	12	
		(5)	State Agencies
		(5)	Political Subdivisions
		(2)	Public
1979	20	15	
1980	20	15	

Table III-42. Program Measure 13

PART III
BUDGET INFORMATION

STATE Montana

Table III-43. Program Measure 13

DATE 1/2/78

Tasks 1-3 will be conducted by the MEO

PART III - BUDGET INFORMATION

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No.* (b)	Estimated Unobligated Funds		New or Revised Budget		
		DOE *** (c)	non-DOE*** (d)	DOE *** (e)	non-DOE *** (f)	Total (g)
1. Tasks 1-3	80.003	$	$	$ 15,000	$ 12,000	$ 27,000
2.						
3.						
4.						
5. TOTALS		$	$	$ 15,000	$ 12,000	$ 27,000

SECTION B - BUDGET CATEGORIES

6 Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1) Tasks 1-3	(2)	(3)	(4)	
a. Personnel	$	$	$	$	$
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	4,000				4,000
f. Contractual					
g. Construction					
h. Other Data Process	11,000				11,000
i. Total Direct Charges					
j. Indirect Charges					
k. TOTALS	$ 15,000	$	$	$	$ 15,000
7. Program Income	$	$	$	$	$ -0-

*--Original State Energy Conservation Plan - 80.001
--Supplemental State Energy Conservation Plan - 80.003

***DOE funds refer to the funds authorized under the Energy Policy and Conservation Act, Title III, Part C, P.L. 94-163, and the Energy Conservation and Production Act, Title IV, Part B, P.L. 94-385, Non-DOE funds refer to all other funds including other authorized DOE funds.

PROGRAM NOTE: CRUDE OIL SAVINGS

PROGRAM MEASURES 3, 5b, 5c, 10

Based on recommendations in the *Final Assessment of the Environmental Impacts of the State Energy Conservation Program* (Page 22), the projected savings in evaporative losses in refineries and additional savings in crude oil can be determined. The total gasoline equivalent from the preceding transportation measures is 41,719,144 gallons of gasoline per year. Assuming an efficiency of 91 percent at the oil refining process, the corresponding savings in refinery losses is 3,755,123 gallons of gasoline per year or .47 trillion BTUs per year. However, we are revising this estimate to correspond with the FEA suggested crude oil savings of .29 trillion BTUs per year.

ADMINISTRATIVE ANALYSIS

A charge often leveled against federal government grant-in-aid programs is that they tend to distort a state's own priorities in the allocation of resources to public policies. Sometimes, the costs to a state in terms of required state legislation, administrative regulations, and/or matching funding requirements outweigh the benefits of the federal assistance. The growth of bureaucratic structure; the expansion of the network of intergovernmental relations; and heightened conflict among officials at national, state and local levels all have been found to follow the acceptance of federal monies intended to meet a variety of social goals. Each state must carefully weigh

for itself the net effect of participation in federal government induced programs requiring state compliance procedures.

This evaluation has been applied to the requirements of the Energy Policy and Conservation Act. The state has concluded that there are substantial net benefits by complying with EPCA. In the first place, Montanans fully embrace the principle of energy conservation and welcome the commitment of all levels of government in the United States to an aggressive, but cooperative, program of husbanding the nation's scarce energy reserves. In fact, Montana's leaders have expressed their intention to be the nation's leaders in this vital area, proceeding well beyond EPCA's minimum standards in pursuit of significant long-range energy savings through the development of renewable energy. Thus, Montana's priorities are the same as those of all of America in this crucial program, and the EPCA goals complement the state's mission.

The heavy emphasis being placed on the voluntary dimensions of energy conservation in Montana, through vehicles such as economic incentive and education programs, allows for minimizing the problems and frictions inherent in changing bureaucratic structures and patterns of intergovernmental relations. Even prior to the EPCA solicitation, the state began seriously considering internal reorganization of several agencies and departments charged with various energy and resource functions. The EPCA stimulus, therefore, has proven to be a catalyzing agent for many activities already set in motion. For this reason, the FEA role in energy conservation is accepted enthusiastically with the expectation that federal funds can assist greatly in the state's own program.

The introduction of a systematic statewide energy conservation program will create little state-local conflict over implementation strategies. Greater clarification in the state-local division of powers and responsibilities is a basic principle of a proposed new code of local government which is the culmination of a three-year study of the powers, capacities and resources of local governments. The state has the responsibility to require conformance of local governments in those energy conservation matters which are of concern to all Montana citizens. At the same time, maximum flexibility is allowed local governments in designing innovative and imaginative methods of energy conservation and alternative energy generation.

IMPACT ON LOCAL GOVERNMENTS

Just as the EPCA grant mechanism requires some alterations of state policies, the state government, in turn, must revise certain state-local relationships to produce compliance with the federal mandate at the local level. The implementation of an energy conservation plan involving local governments coincides with the last phase of a three-year program of local government reorganization whose scope is unparalleled anywhere in the nation. The Legislature currently is considering a massive recodification of local government laws which, if adopted, will change dramatically the powers, capabilities, resources and functions of local governments throughout the state. In combination with existing constitutional provisions, earlier laws, and decisions recently reached by the electorates of many local units in the

recently completed voter review process, this recoding signals a new era of maximum local self-determination in Montana. The requirements imposed upon local governments by an energy conservation plan must be weighed carefully in the context of these changes. A well designed energy conservation plan can take advantage of this expanded local self-determination.

The second major area of consideration is the possible friction between state and local levels of government in implementing mandated programs. Here again, the consequences of the three-year state review of local government functions is pertinent. There currently is much greater acceptance of the principle of dividing primary responsibility for various service functions between state and local levels. Thus, while a certain activity which is primarily a state responsibility may be delegated to local governments, the delegation must be accompanied by the provision of the resources required to carry out the activity. Adherence to this principle is illustrated by the satisfactory manner in which the problem of local building code inspection has been handled.

The EPCA guidelines do not require the State of Montana to violate the new compact of liberation with its local government partners. Certain conservation areas afford an opportunity for strengthening the partnership through collaborative compliance with EPCA mandates. Procurement practices provide the best illustration since the state is authorized to select the methods most appropriate to its circumstances for inducing political subdivisions to adapt their practices to state procedures. In Montana, the choice has been made to work through established channels of state-local communicators where cooperation and collaboration have been chosen as the

method of achieving objectives. To this end, programs of orientation and training at the state level will be offered for local official participation as well. Regularized communication of new developments in training, procedures or assistance will be made to local officials. State and local officials will participate jointly in planning and implementing future training and review sections. Local governments will be encouraged to participate in state purchasing contracts to maximize energy savings. In each of these respects, the emerging cooperative relationship between state and local governments is reinforced rather than threatened.

In summary, the EPCA mandates introduce no significant dysfunctional variables into the equation of state-local relationships in Montana.

IMPACT ON STATE AGENCIES

The various implementation strategies add mandates within a number of state agencies. Some changes were of immediate concern and required action of the 1977 Montana Legislative Session, while others have been handled through executive revision of existing administrative structures.

In addition to the Montana Energy Office, the intensified concern with energy conservation will produce the following changes in agency structures and mandates. The Department of Administration is given significant additional responsibilities, some of which are to be carried out in conjunction with related state agencies. The Department of Administration is charged with producing the life cycle cost analysis for state buildings and procurement of major energy consuming equipment. The Department of Administration also is assigned primary responsibility for creating and implementing the

building code provisions for thermal and lighting efficiency, but must work with the Department of Health and Environmental Sciences in developing the code's contents and with the Department of Community Affairs in its implementation by local building code inspectors, lending institutions, etc.

The Department of Community Affairs is given several new or expanded functions as a result of the need to promote conservation at the local level. Expansion of the weatherization program will require continuation of the cooperative effort involving the Department of Social and Rehabilitation Services. No new mandates or unmanageable problems of compliance are imposed by this program. These two agencies already have addressed methods of enhancing efficiency and promoting increased cooperation in achieving the goal of assisting low income persons in saving energy costs.

The Department of Revenue will have a major new responsibility: The implementation of tax credit and accelerated amortization of cost systems for promoting installation or acquisition of renewable energy resource equipment.

Other agencies will be assigned duties consistent with their current primary missions. For example, the Department of Justice in the speed limit enforcement program and the Public Service Commission in the state utility rate structure program. The Department of Natural Resources, current sponsors of the state's grant and loan programs for alternative energy development, likely will have a continuing involvement in those conservation activities which interface its mandate. The intergovernmental framework will be complicated in the future by the possible development of a source separation solid waste recovery system within the Department of Health and Environmental Sciences.

ASSESSMENT OF ENERGY SAVINGS

The energy savings estimated in this plan are based on projections. Projections are a "best guess" of what will happen in the future based on numerous assumptions. If those assumptions do not match reality, the projections will be wrong. There are many variables that simply cannot be quantified. Thus, in addition to adopting the measures outlined, the state must monitor patterns in energy consumption within Montana very carefully to insure that the various Program Measures are indeed having the desired effect. The worst mistake that the state could make would be to do nothing.

CHAPTER IV

SECTOR IMPLEMENTATION PLAN

The previous chapter presented the milestones and implementation plans for each of the Program Measures identified in accordance with Federal requirements. During the current re-examination of the Montana plan, it became obvious that energy conservation would have to be approached from a broader perspective than that suggested by the Program Measures if meaningful long-term results were to be achieved. This chapter attempts to portray the logic of the program as it applies to each of the major energy consumption sectors:

Residential
Transportation
Commercial
Industrial
Agricultural Production

The sections that follow discuss each of the sector problems and portray the logical sequencing of events and activities that will be necessary to resolve the problem of reducing energy consumption. It should be noted that no attempt has been made to calculate a projected energy savings in this chapter. In accordance with Federal requirements, projected energy savings were calculated for the Program Measures described in the previous chapter.

Perhaps an explanation of the logic charts contained in this chapter would be appropriate at this time. As discussed in Chapter I, Plan Intent, the diagrams were developed following the FAST diagraming technique. The

charts are arranged such that they can be read from left to right by asking the question, "How are we going to accomplish this goal?" The charts can also be read from right to left by asking the question, "Why are we doing this?" The charts are intended to portray, as clearly as possible, the hierarchical structure involved in an endeavor of this complexity.

Logic charts have been developed for each of the sector involvements. The first chart in each series is an overview chart showing the major activities necessary to impact the general goal established for each sector. The charts that follow are developed to show how those activities are carried down to a level where tasks become more clearly identified. Even at that level it is possible to identify alternatives, but because of the state-of-the-art of energy conservation planning, it was decided that further breakdown of the alternatives at this time might be more confusing than enlightening.

It should be noted that the charts can be quite useful for satisfying management needs other than establishing priorities for resource allocation. For example, applying the evaluation concepts described in Chapter V of this document to the program structure depicted by the charts will enable one to draw certain inferences as to the relative worth of a specific project in terms of how well it assisted in reaching a higher order goal. In addition, the program structure will facilitate development of an energy conservation data base -- a need that it is hoped will be resolved during the next year.

It should also be noted that all the plan components are designed to focus on one of the more serious problems encountered; i.e., the lack of

public awareness and dedication to resloving the energy problem. Each of the sector plans contains special emphasis on informing those concerned about the special problems they should be solving. The theory is that if homeowners can be made more conscious of the need to conserve energy, those attitudes will carry over into their places of work and transportation habits. It is impossible to reach everyone involved in each sector with the workshops. However, it should be possible to reach enough people to form a nucleus of energy conscious persons who in turn could reach others.

RESIDENTIAL SECTOR

As was stated previously in this plan, the residential sector consumes about 15 percent of the energy used in Montana. Of this amount, about 88 percent is used for space and water heating. The remaining energy is used to power lights and appliances. Natural gas is the major fuel used, accounting for roughly two-thirds of the energy used in the residential sector. The remaining energy use is broken down almost evenly between electricity and other sources such as propane and fuel oil.

From this one can see that significant impacts in the residential sector will require programs designed to reduce space and water heating consumption. Undoubtedly, continued emphasis must be placed on more efficient use associated with lighting and appliances, but the major savings will be in the other areas.

GENERAL APPROACH

As can be seen in the following logic charts, the solution to reducing energy consumption in the residential sector becomes one of implementing programs to reduce energy consumption in existing residences and minimizing energy usage requirements in new residences. While these two thrusts have certain similarities, the proposed implementation strategies are quite different. However, it should be noted that some of the educational activities associated with existing residences are equally applicable to occupants/owners of new residences and would be available to that group.

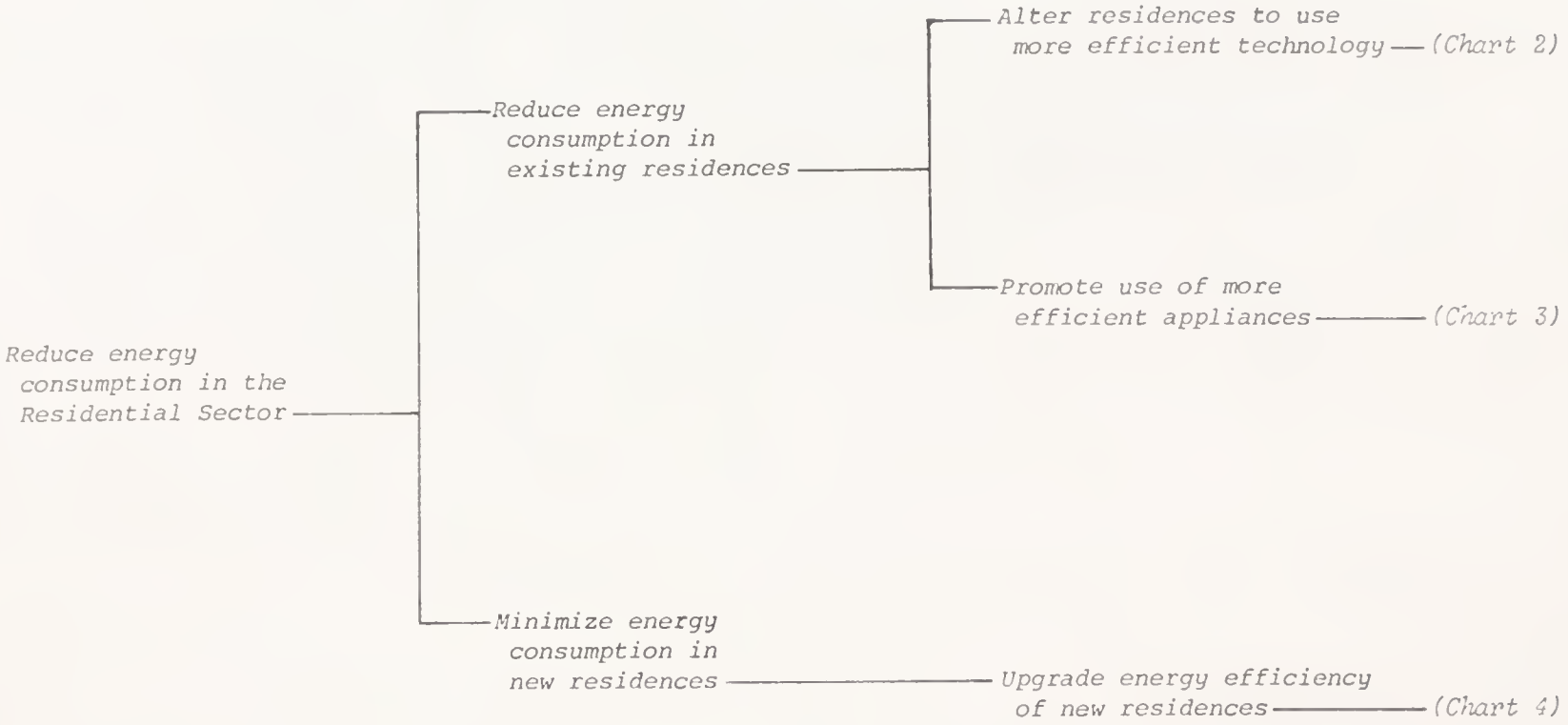
Reduce energy consumption in the Residential Sector
Reduce energy consumption in existing residences
Alter residences to use more efficient technology
(Chart 2)
Promote use of more efficient appliances
(Chart 3)
Minimize energy consumption in new residences
Upgrade energy efficiency of new residences
(Chart 4)

Figure IV-1. RESIDENTIAL SECTOR
Chart 1

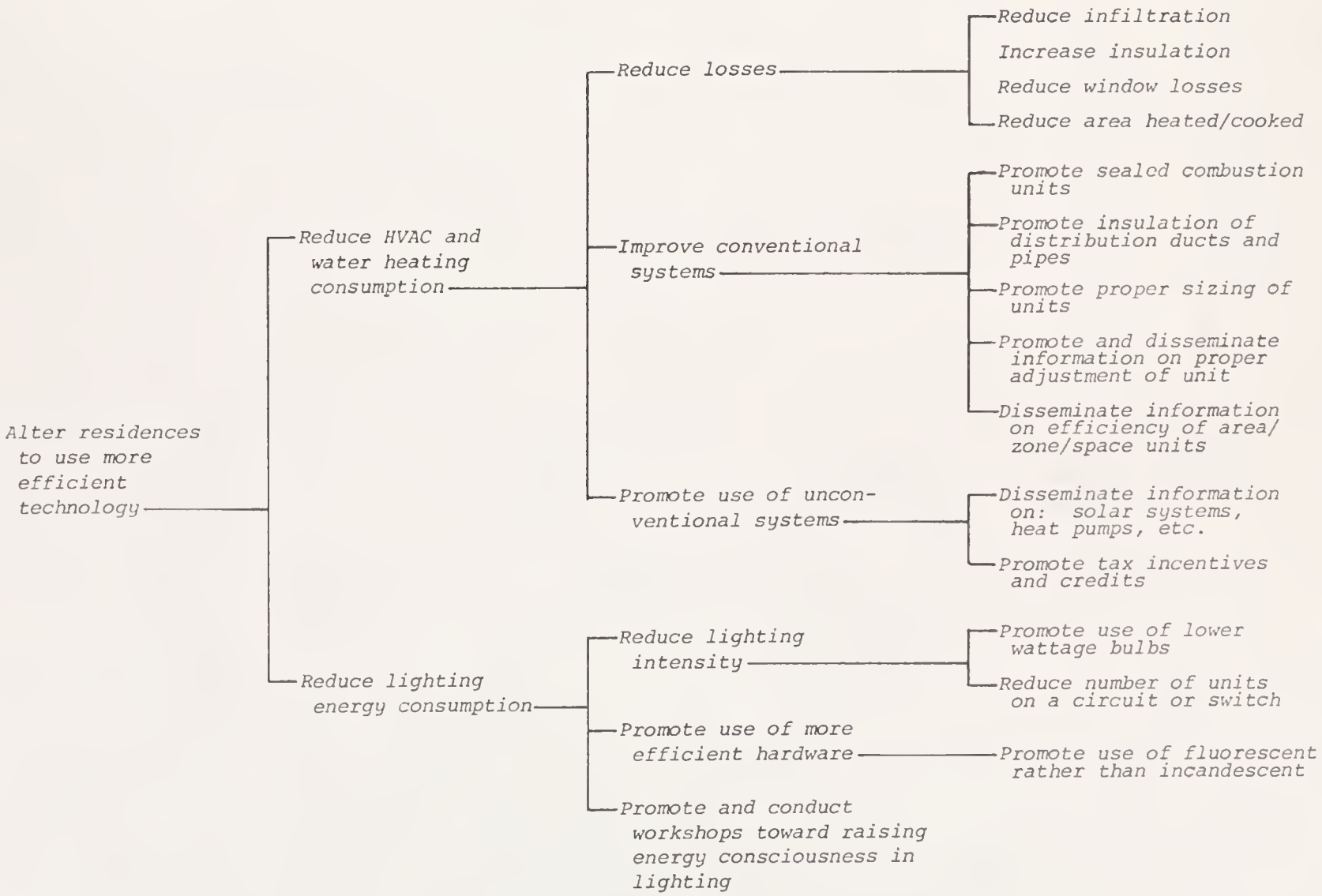
Alter residences to use more efficient technology
Reduce HVAC and water heating consumption
Reduce losses
Reduce infiltration
Increase insulation
Reduce window losses
Reduce area heated/cooked
Improve conventional systems
Promote sealed combustion units
Promote insulation of distribution ducts and pipes
Promote proper sizing of units
Promote and disseminate information on proper adjustment of unit
Disseminate information on efficiency of area/ zone/space units
Promote use of unconventional systems
Disseminate information on: solar systems, heat pumps, etc.
Promote tax incentives and credits
Reduce lighting energy consumption
Reduce lighting intensity
Promote use of lower wattage bulbs
Reduce number of units on a circuit or switch
Promote use of more efficient hardware
Promote use of fluorescent rather than incandescent
Promote and conduct workshops toward raising energy consciousness in lighting

Figure IV-2. RESIDENTIAL SECTOR
Chart 2

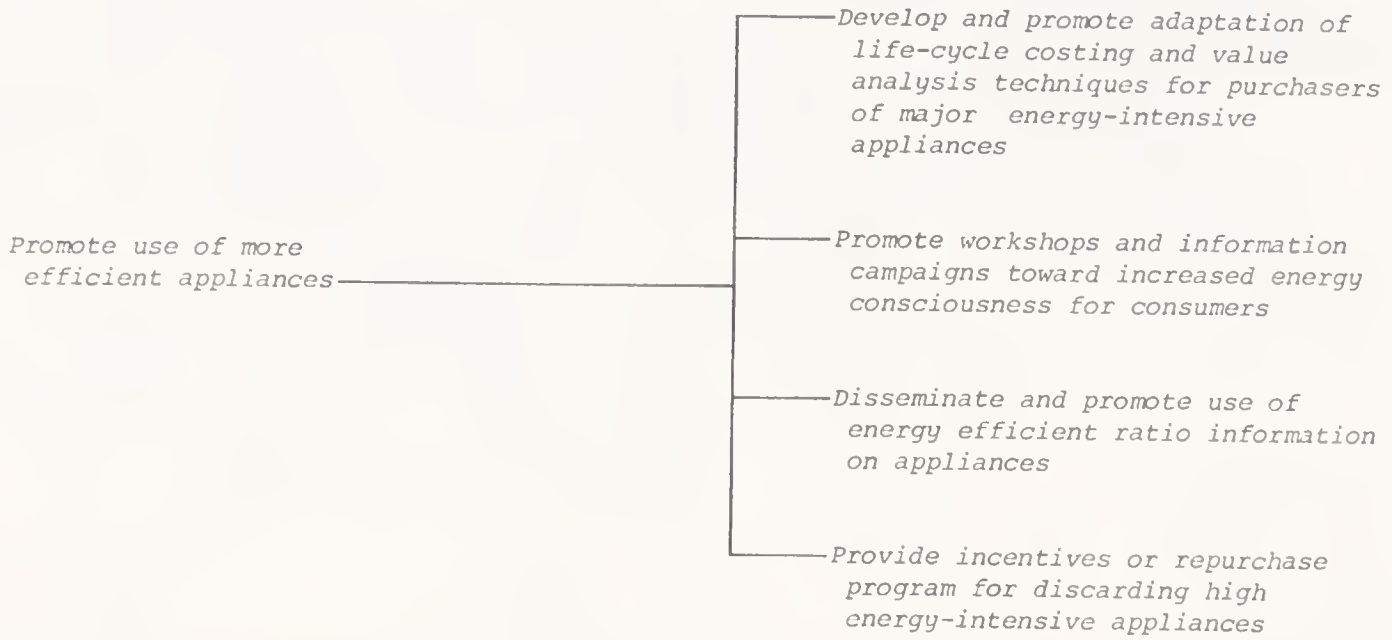
Promote use of more efficient appliances
Develop and promote adaptation of life-cycle costing and value analysis techniques for purchasers of major energy-intensive appliances
Promote workshops and information campaigns toward increased energy consciousness for consumers
Disseminate and promote use of energy efficient ratio information on appliances
Provide incentives or repurchase program for discarding high energy-intensive appliances

Figure IV-3. RESIDENTIAL SECTOR
Chart 3

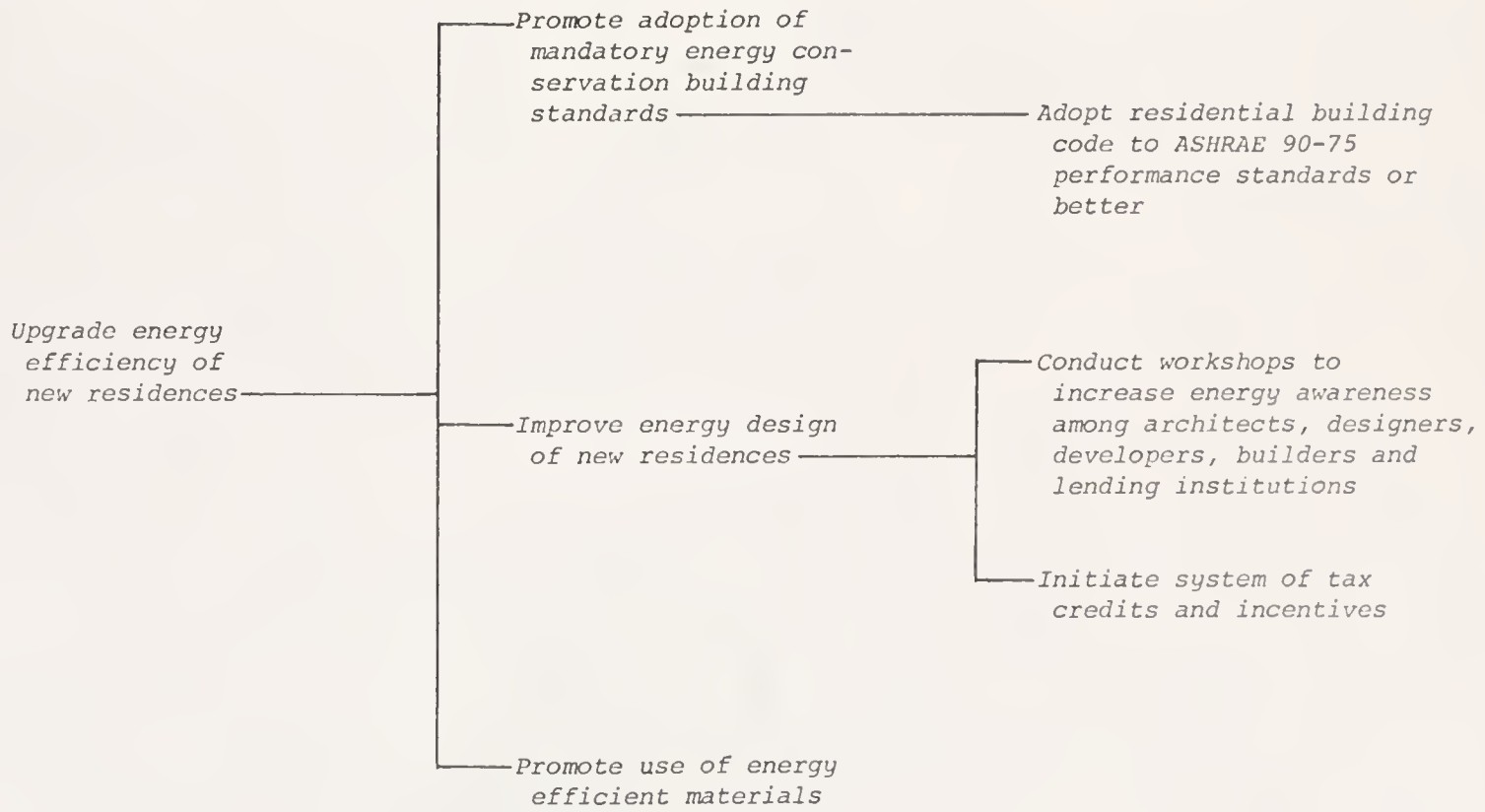
Upgrade energy efficiency of new residences
Promote adoption of mandatory energy conservation building standards
Adopt residential building code to ASHRAE 90-75 performance standards or better
Improve energy design of new residences
Conduct workshops to increase energy awareness among architects, designers, developers, builders and lending institutions
Initiate system of tax credits and incentives
Promote use of energy efficient materials

Figure IV-4. RESIDENTIAL SECTOR
Chart 4

TRANSPORTATION SECTOR

Montana's transportation sector directly used 31 percent of the total energy consumed in the state in 1974. The use of motor gasoline in Montana has grown fairly steadily at an average annual growth rate of about 3 percent since 1950. The majority of the gasoline consumed in Montana in 1974 was produced at in-state refineries. Only 16 percent of the feedstock for Montana refineries was produced in Montana. Forty percent of the feedstock for Montana refineries currently is imported from Canada. This feedstock is scheduled to be eliminated in the 1980's, and replacement feedstocks have not yet been located. Gasoline consumption accounts for 73 percent of the energy used in the transportation sector, highway diesel fuel accounts for another 9 percent and the remaining 18 percent is used by railroads.

One of the problems encountered in developing strategies for impacting this sector is to find feasible alternative forms of transportation that could be significant in this state. The entire economy and development of the resources available in the state are dependent on the mobility of passenger car and truck transportation. The large distances covered and the dispersed nature of the population combine to make private vehicle transportation the most attractive form to most of our citizens. Any proposed changes to this system must be cognizant of the general public's attitudes in regard to acceptance of alternative forms of transportation or they are doomed to failure before they start.

Much of the activity in this sector is governed by national concerns as well. The automotive industry's attempts to develop more fuel efficient

vehicles is a good example of this influence. In addition, there are groups who advocate concentration on conversion of stationary energy users to alternative fuels to release petroleum base fuels to the transportation sector. To the extent we can do so, we intend to remain cognizant of these outside influences to determine what impact they may have on our approach to reduce transportation energy consumption in Montana.

GENERAL APPROACH

The program to impact the transportation sector energy demands recognizes the protective spirit evident in the public's demand for mobility. Several proposed programs designed to bring more efficiency into the transportation sector are discussed in some detail in Chapter III, Description of Program Measures.

We also propose to begin work that should lead to some longer term benefits. The following logic flow charts present some of the activities we consider necessary in achieving both short and long term impacts in this sector.

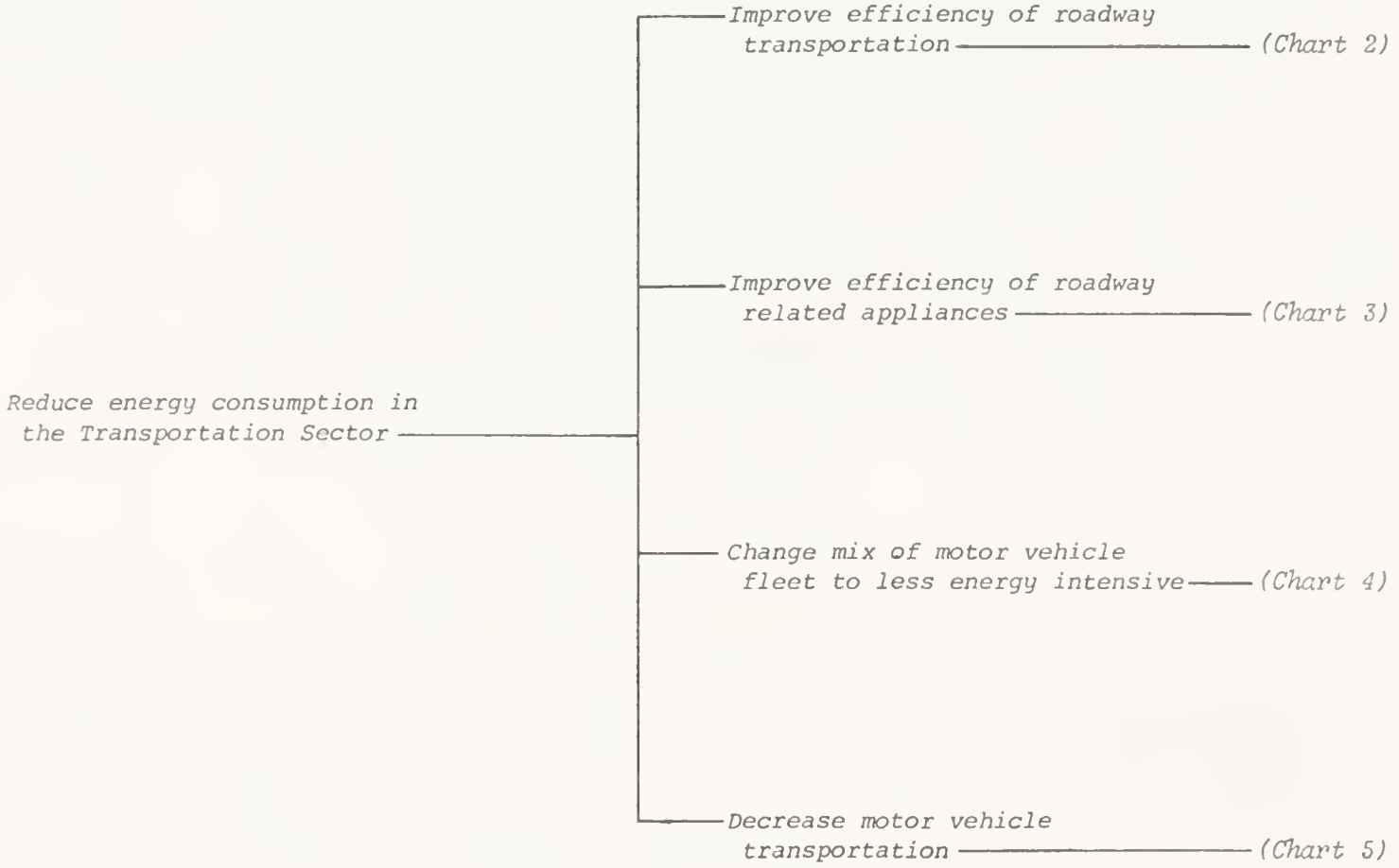
Reduce energy consumption in the Transportation Sector
Improve efficiency of roadway transportation
(Chart 2)
Improve efficiency of roadway related appliances
(Chart 3)
Change mix of motor vehicle fleet to less energy intensive
(Chart 4)
Decrease motor vehicle transportation
(Chart 5)

Figure IV-5. TRANSPORTATION SECTOR
Chart 1

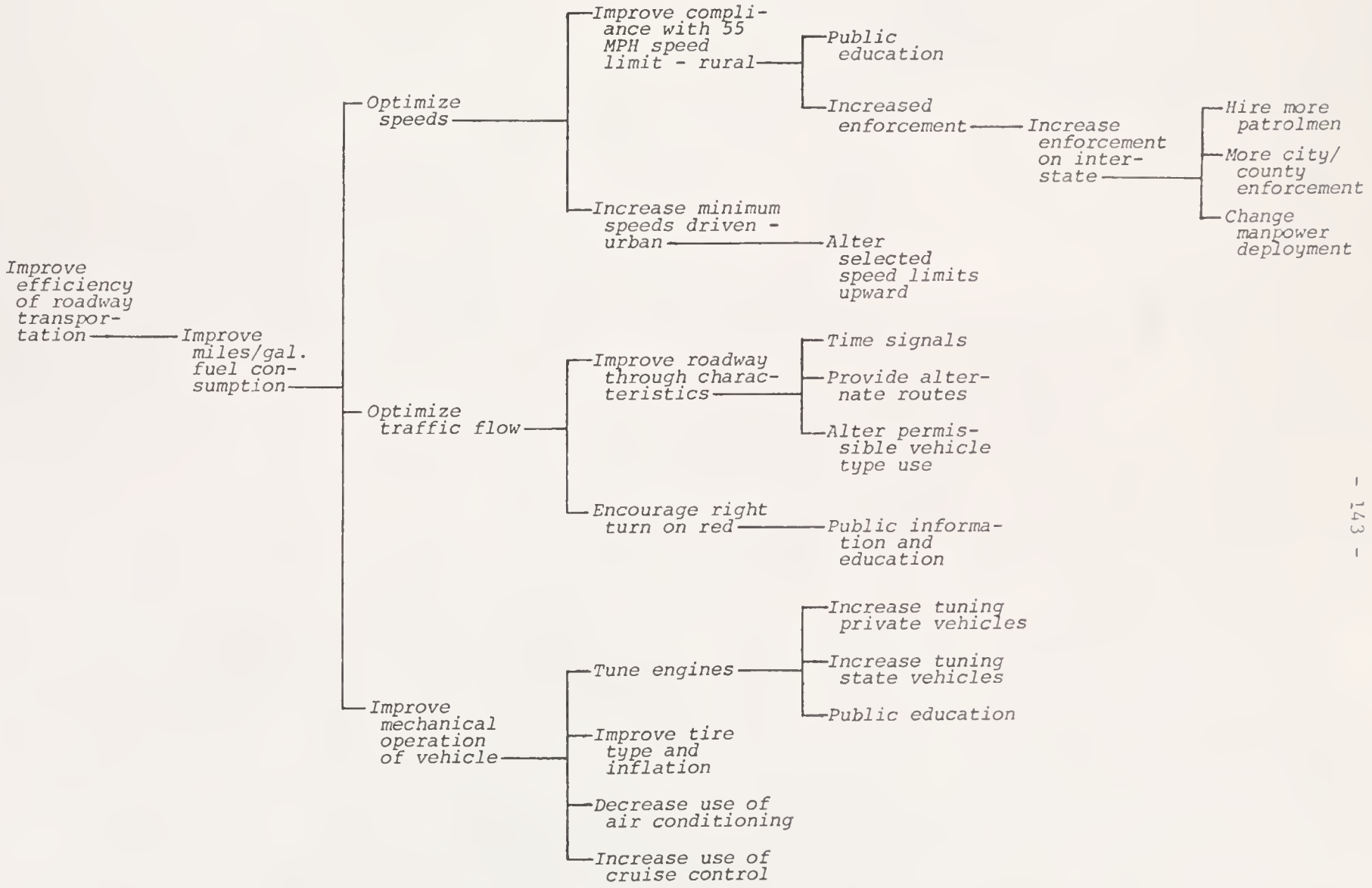

Figure IV-6. TRANSPORTATION SECTOR
Chart 2

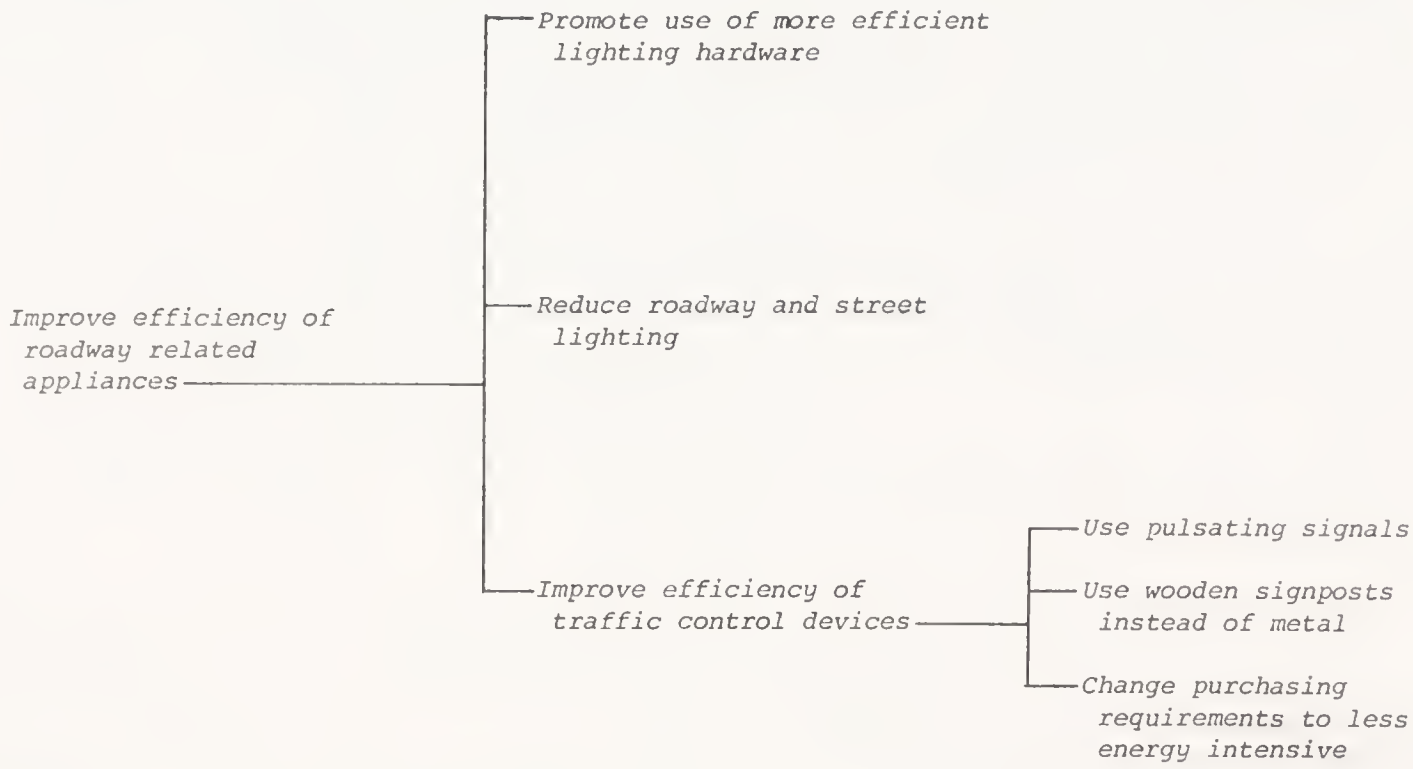
Improve efficiency of roadway related appliances
Promote use of more efficient lighting hardware
Reduce roadway and street lighting
Improve efficiency of traffic control devices
Use pulsating signals
Use wooden signposts instead of metal
Change purchasing requirements to less energy intensive

Figure IV-7. TRANSPORTATION SECTOR
Chart 3

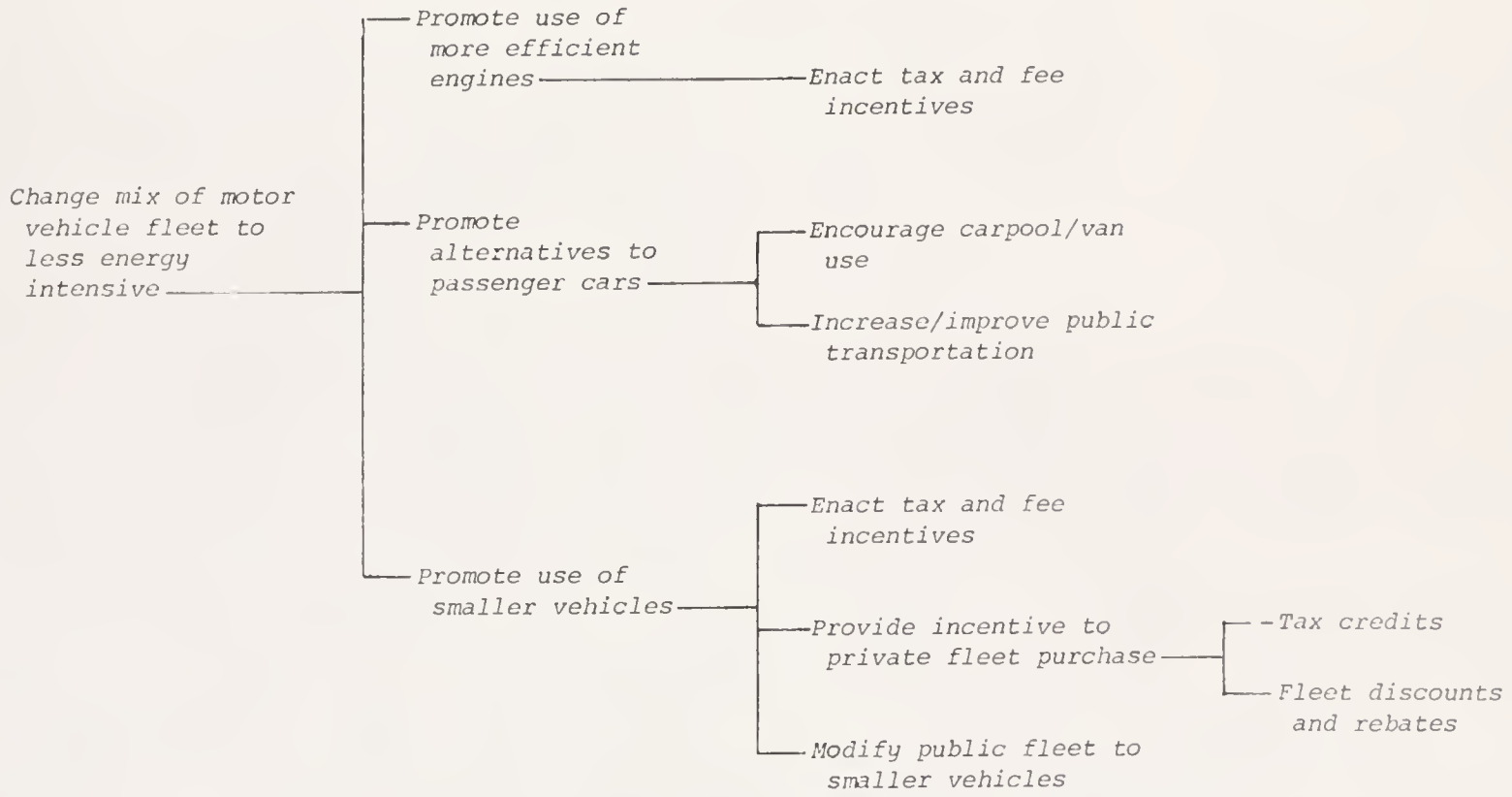
Change mix of motor vehicle fleet to less energy intensive
Promote use of more efficient engines
Enact tax and fee incentives
Promote alternatives to passenger cars
Encourage carpool/van use
Increase/improve public transportation
Promote use of smaller vehicles
Enact tax and fee incentives
Provide incentive to private fleet purchase
Tax credits
Fleet discounts and rebates
Modify public fleet to smaller vehicles

Figure IV-8. TRANSPORTATION SECTOR
Chart 4

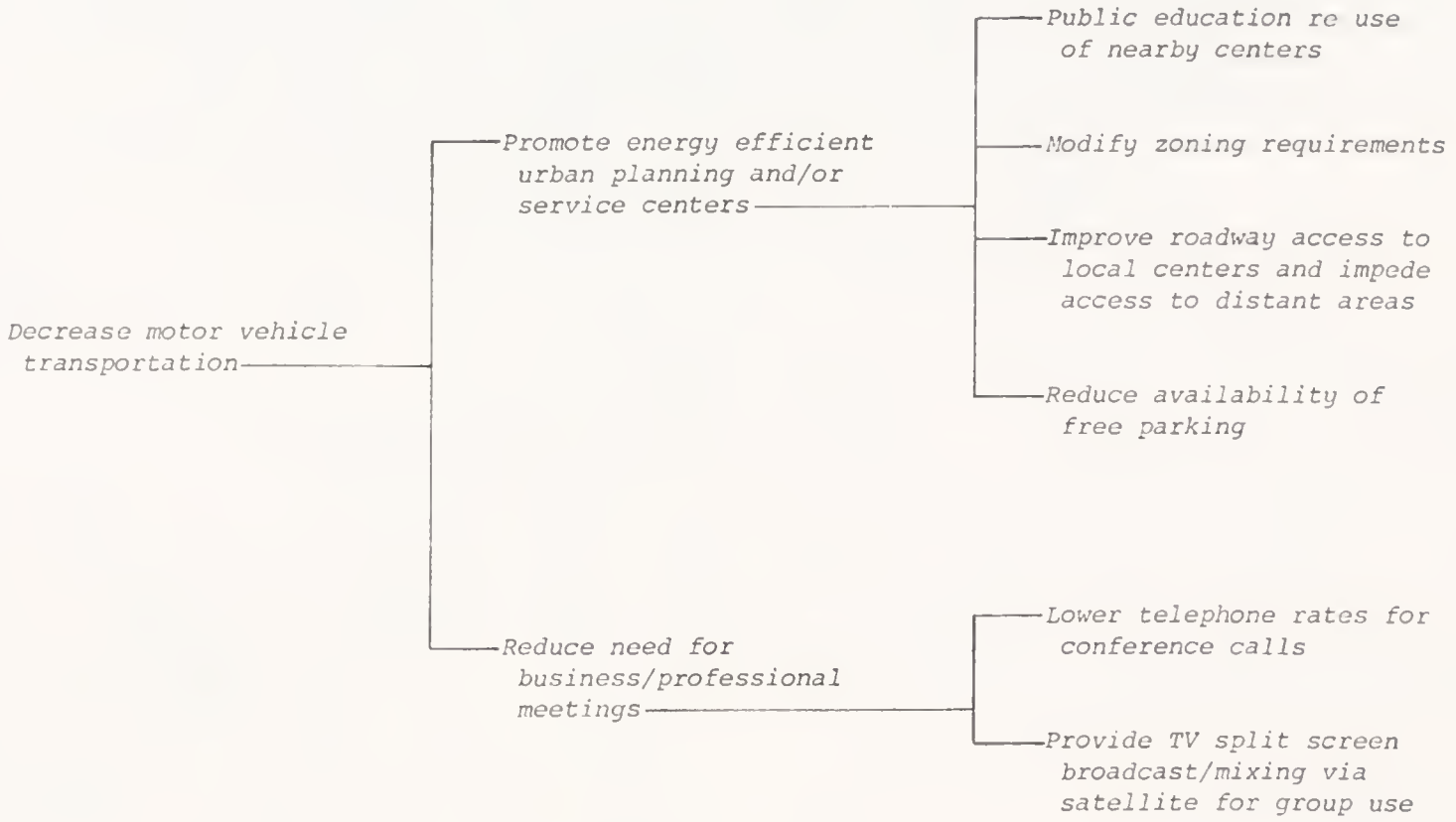
Decrease motor vehicle transportation
Promote energy efficient urban planning and/or service centers
Public education re use of nearby centers
Modify zoning requirements
Improve roadway access to local centers and impede access to distant areas
Reduce availability of free parking
Reduce need for business/professional meetings
Lower telephone rates for conference calls
Provide TV split screen broadcast/mixing via satellite for group use

Figure IV-9. TRANSPORTATION SECTOR
Chart 5

COMMERCIAL SECTOR

The commercial sector also accounts for about 15 percent of the energy used in Montana. Of this, about 75 percent is used directly in commercial buildings. In commercial buildings about 62 percent of the energy used is for space heating and air conditioning. An additional 28 percent is used for lighting. Natural gas accounts for about 50 percent of the energy used in commercial buildings; electricity accounts for 35 percent and the remaining energy is divided between fuel oil, coal and propane.

From this, one can see that approximately 90 percent of the energy consumption in the commercial sector is related to space heating, air conditioning and lighting. This, then, would seem to be the area warranting the major emphasis. Other areas in the commercial sector could undoubtedly be improved but with a target area of only ten percent, it would seem that special emphasis or high priority programs would not be as cost effective in terms of energy saved for program efforts expended.

GENERAL APPROACH

As in the residential sector, efforts will be concentrated on alterations to existing buildings and development of procedures that will result in more energy efficient new construction. The work effort will also be similar but targeted to different groups. The logic charts which follow generally show the direction of effort. The charts describe the kind of activities considered necessary to make a measurable impact in this sector.

It should be noted that governmental buildings are included in the commercial sector. The relatively large number of State owned or leased office buildings of varying construction, which are located throughout the State, provides a distinct opportunity for serving as an example to the remainder of the commercial sector which includes city, county and private ownership. As discussed in Program Measure 3a, significant progress has been and continues to be made in impacting this rather large segment of the commercial sector.

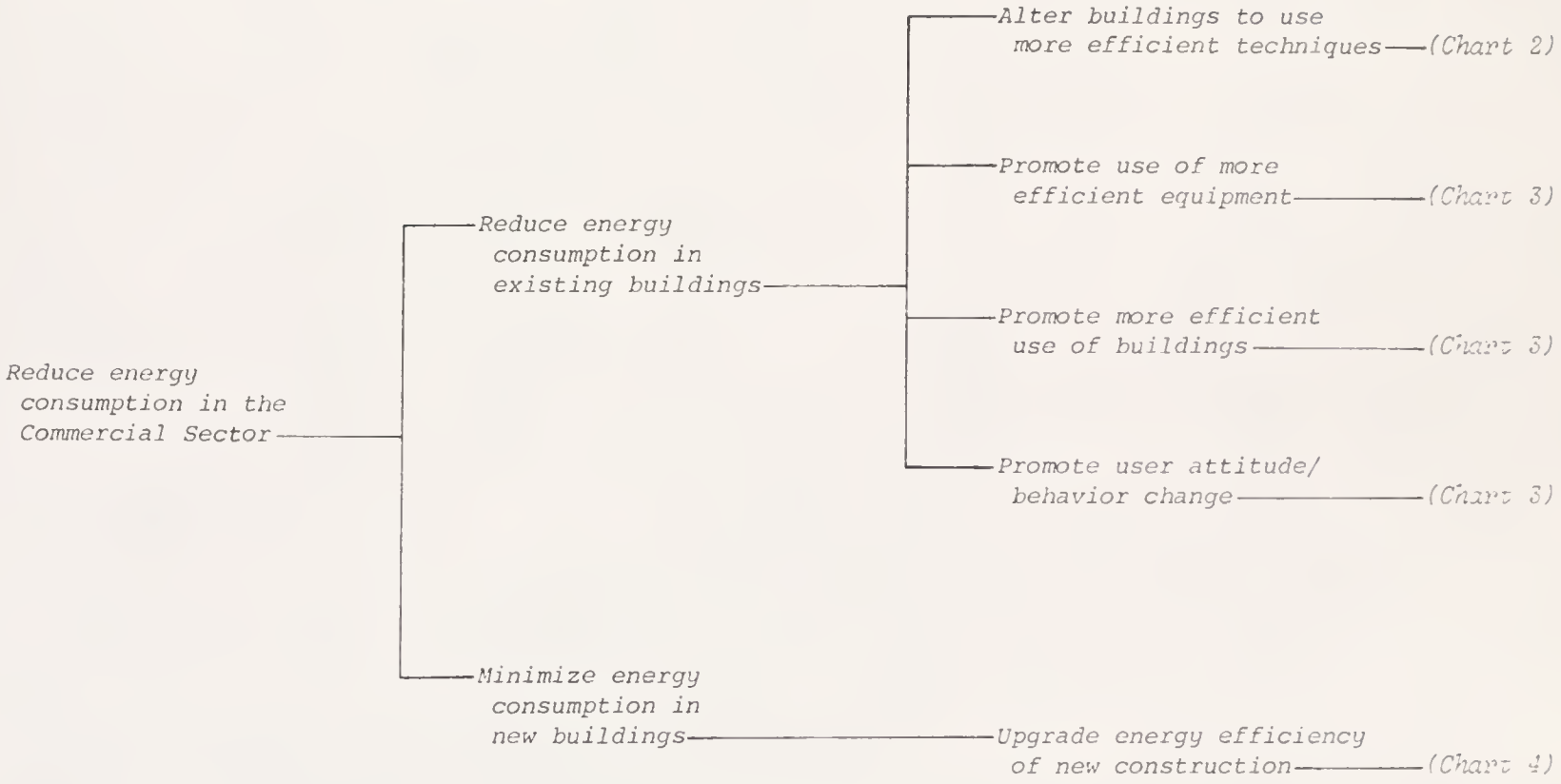
Reduce energy consumption in the Commercial Sector
Reduce energy consumption in existing buildings
Alter buildings to use more efficient techniques
(Chart 2)
Promote use of more efficient equipment
(Chart 3)
Promote more efficient use of buildings
(Chart 3)
Promote user attitude/ behavior change
(Chart 3)
Minimize energy consumption in new buildings
Upgrade energy efficiency of new construction
(Chart 4)

Figure IV-10. COMMERCIAL SECTOR
Chart 1

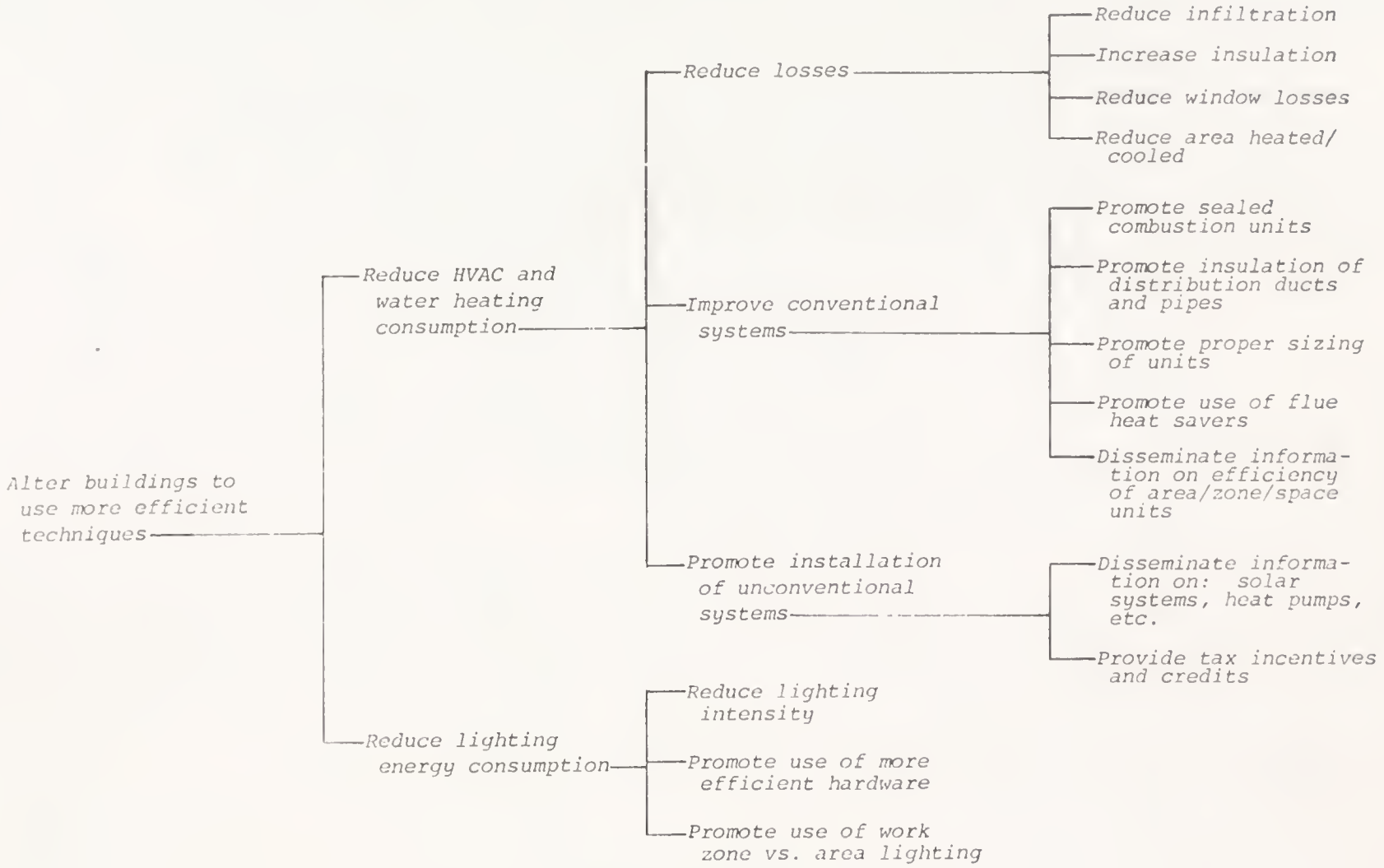
Alter buildings to use more efficient techniques
Reduce HVAC and water heating consumption
Reduce losses
Reduce infiltration
Increase insulation
Reduce window losses
Reduce area heated/ cooled
Improve conventional systems
Promote sealed combustion units
Promote insulation of distribution ducts and pipes
Promote proper sizing of units
Promote use of flue heat savers
Disseminate information on efficiency of area/zone/space units
Promote installation of unconventional systems
Disseminate information on: solar systems, heat pumps, etc.
Provide tax incentives and credits
Reduce lighting energy consumption
Reduce lighting intensity
Promote use of more efficient hardware
Promote use of work zone vs. area lighting

Figure IV-11. COMMERCIAL SECTOR
Chart 2

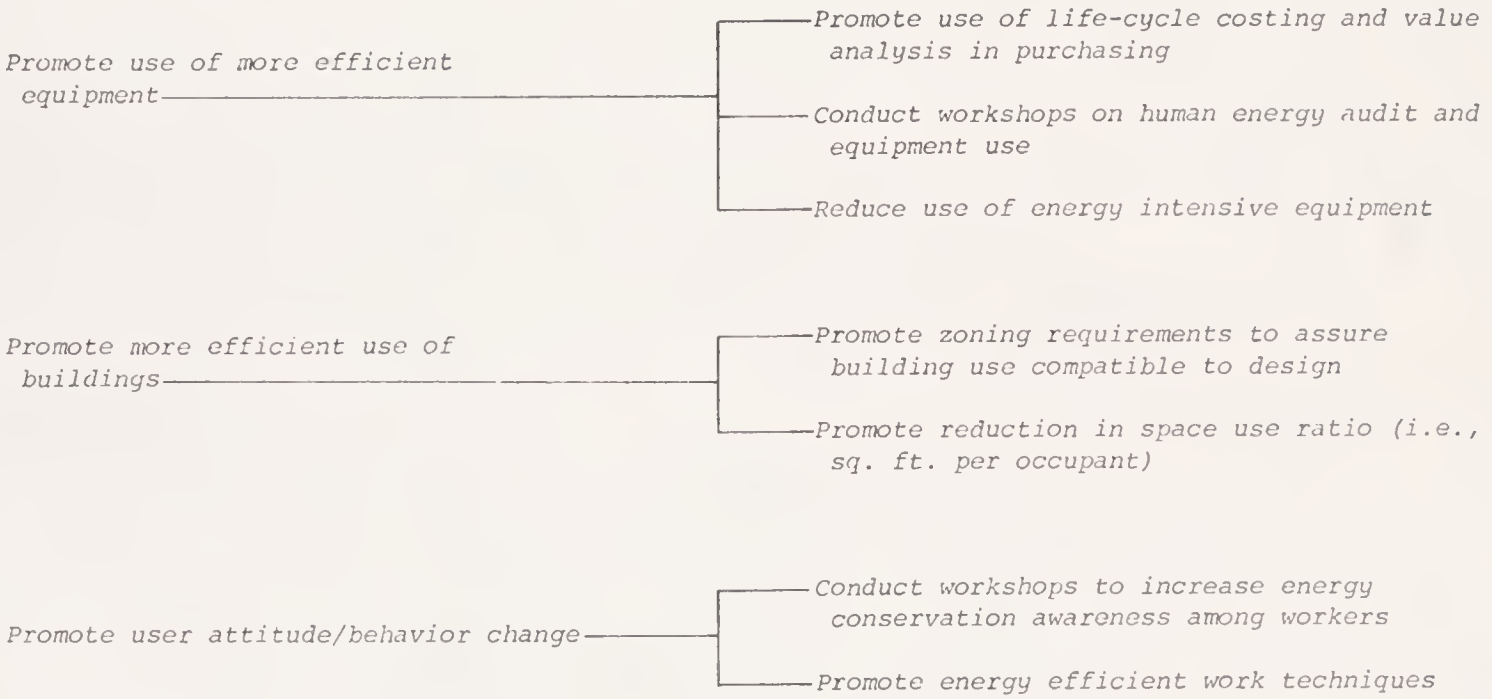
Promote use of more efficient equipment
Promote use of life-cycle costing and value analysis in purchasing
Conduct workshops on human energy audit and equipment use
Reduce use of energy intensive equipment
Promote more efficient use of buildings
Promote zoning requirements to assure building use compatible to design
Promote reduction in space use ratio (i.e., sq. ft. per occupant)
Promote user attitude/behavior change
Conduct workshops to increase energy conservation awareness among workers
Promote energy efficient work techniques

Figure IV-12. COMMERCIAL SECTOR
Chart 3

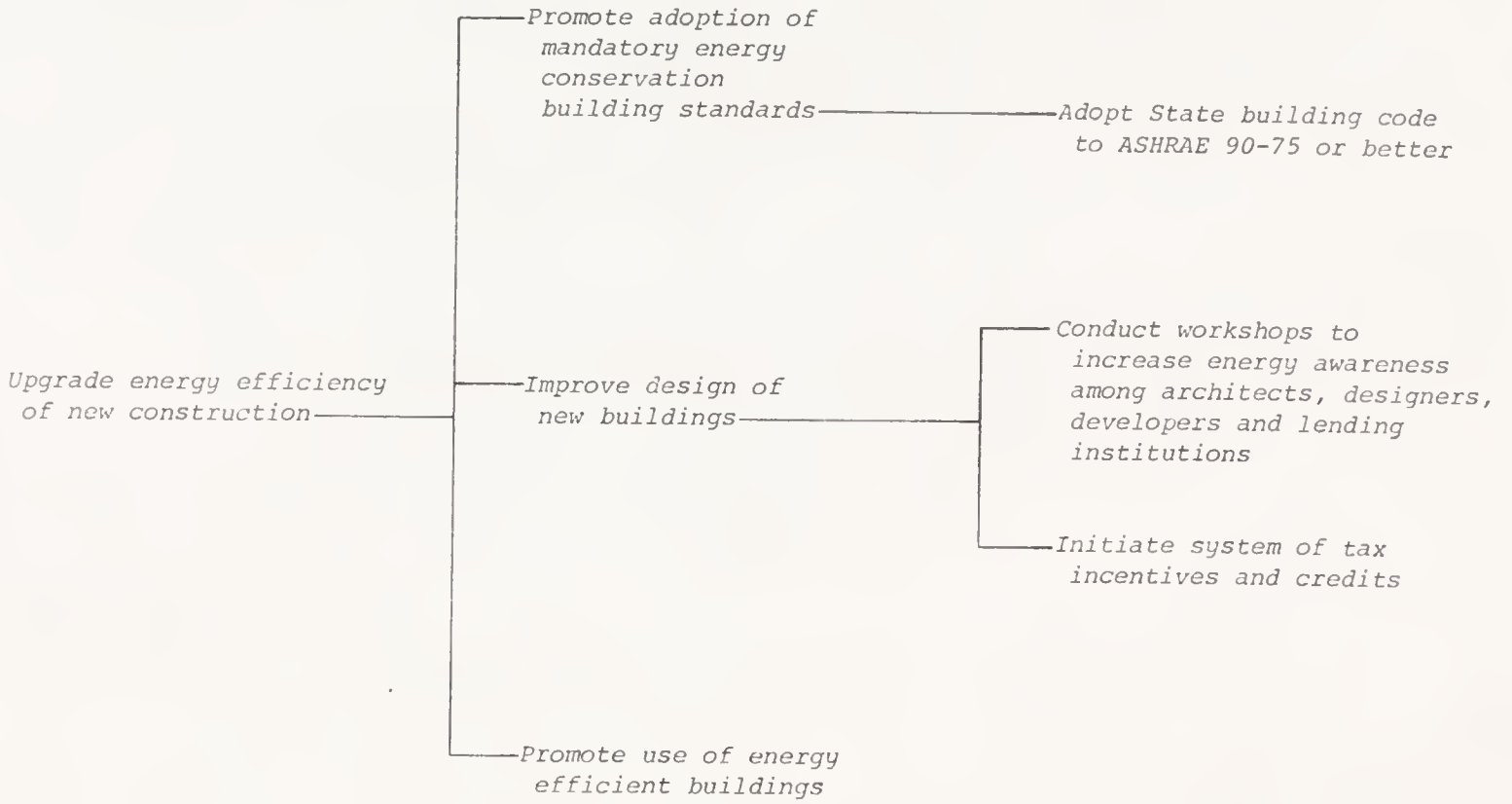
Upgrade energy efficiency of new construction
Promote adoption of mandatory energy conservation building standards
Adopt State building code to ASHRAE 90-75 or better
Improve design of new buildings
Conduct workshops to increase energy awareness among architects, designers, developers and lending institutions
Initiate system of tax incentives and credits
Promote use of energy efficient buildings

Figure IV-13. COMMERCIAL SECTOR
Chart 4

INDUSTRIAL SECTOR

Over the past decade, energy consumption in Montana industry has grown faster than the energy consumption of any other sector. Montana industries currently consume 35 percent of the total energy used in the state. Montana industry consumes over 40 percent of all natural gas sold within the state, as well as over 60 percent of the electricity. A major portion of this energy use is concentrated in a few basic industries -- mineral mining and processing, wood products and paper, oil refining, food products and cement.

The energy consumed in the industrial sector consists of a combination of that used in the industrial process as well as that used to provide a comfortable surrounding for the process. The major emphasis of our program is directed toward conservation strategies designed to impact the energy consumption in the buildings and associated activities supporting the industrial process. An attempt to effect energy economies in industrial processes would require a level of expertise not available in this office.

As stated in Chapter I of this plan, a considerable amount of energy is used by governmental entities in fulfilling their obligations relating to solid waste management. The energy consumption estimates for these services are included in the industrial sector estimates. The methodologies we intend to implement for the industrial sector are equally appropriate to this important area of governmental services.

GENERAL APPROACH

The general direction of our activities in the industrial sector is to focus on the energy savings that might accrue from more efficient buildings housing the industrial process. From that standpoint, the proposed strategy is similar to those of the residential and commercial sectors. It stands to reason that some economies in space heating/cooling and lighting energy demands can be achieved. The recent survey of the largest energy consumers in the State should give further direction in this regard. The survey responses are being analyzed now and the results should be available in early 1978.

Our involvement in achieving energy savings in industrial processes is more educational than technical in nature. The approach we have deemed to be most appropriate to our needs is to work with industry to instill an awareness of energy conservation concepts in all levels in the industrial process. We intend to assist in the development of a series of workshops geared toward various groups in the industrial process, including top management, purchasing officers and production personnel.

The following logic charts describe the kinds of activities we consider necessary to make a measurable impact on this sector.

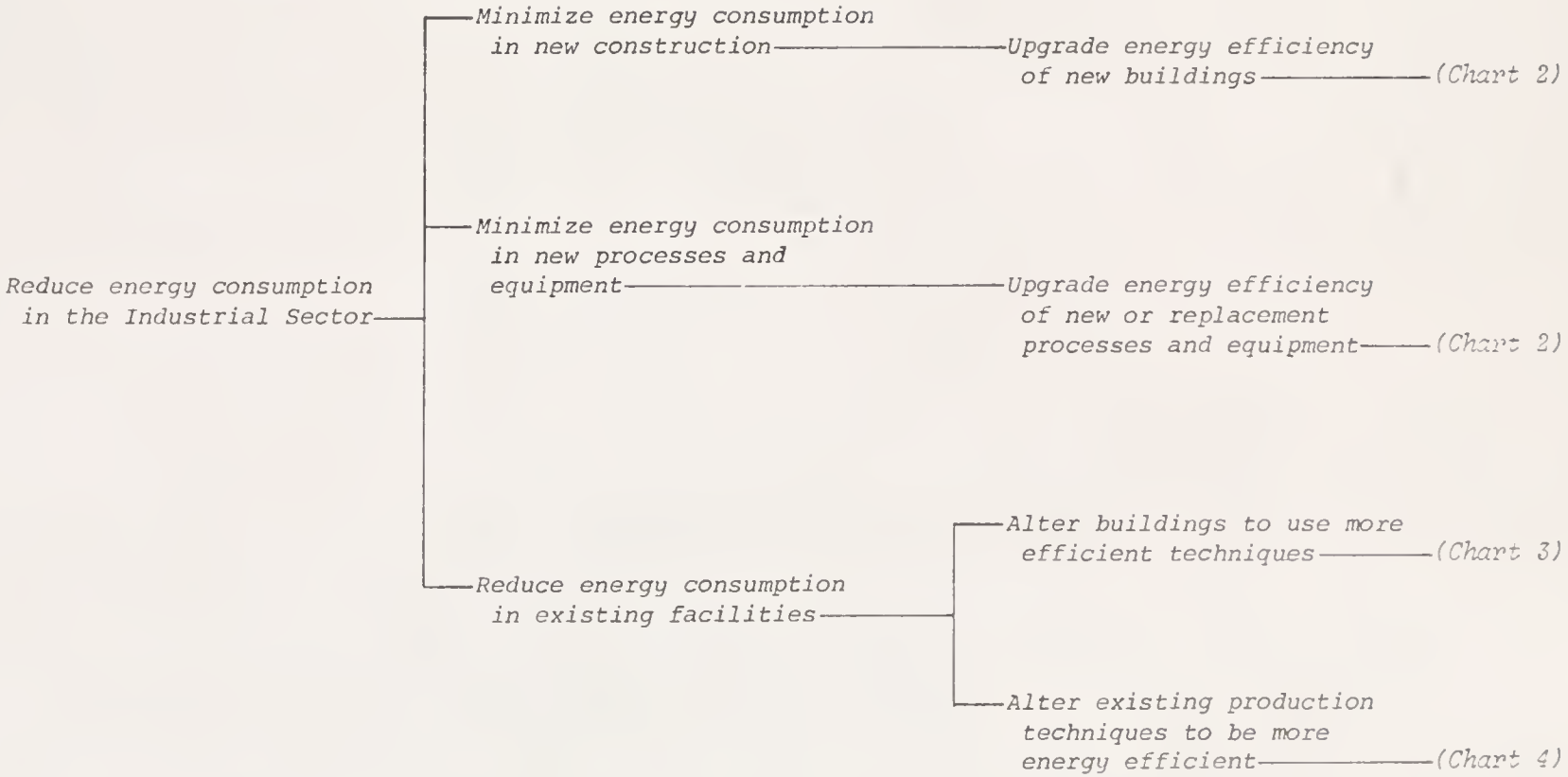
Reduce energy consumption in the Industrial Sector
Minimize energy consumption in new construction
Upgrade energy efficiency of new buildings
(Chart 2)
Minimize energy consumption in new processes and equipment
Upgrade energy efficiency of new or replacement processes and equipment
(Chart 2)
Reduce energy consumption in existing facilities
Alter buildings to use more efficient techniques
(Chart 3)
Alter existing production techniques to be more energy efficient
(Chart 4)

Figure IV-14. INDUSTRIAL SECTOR
Chart 1

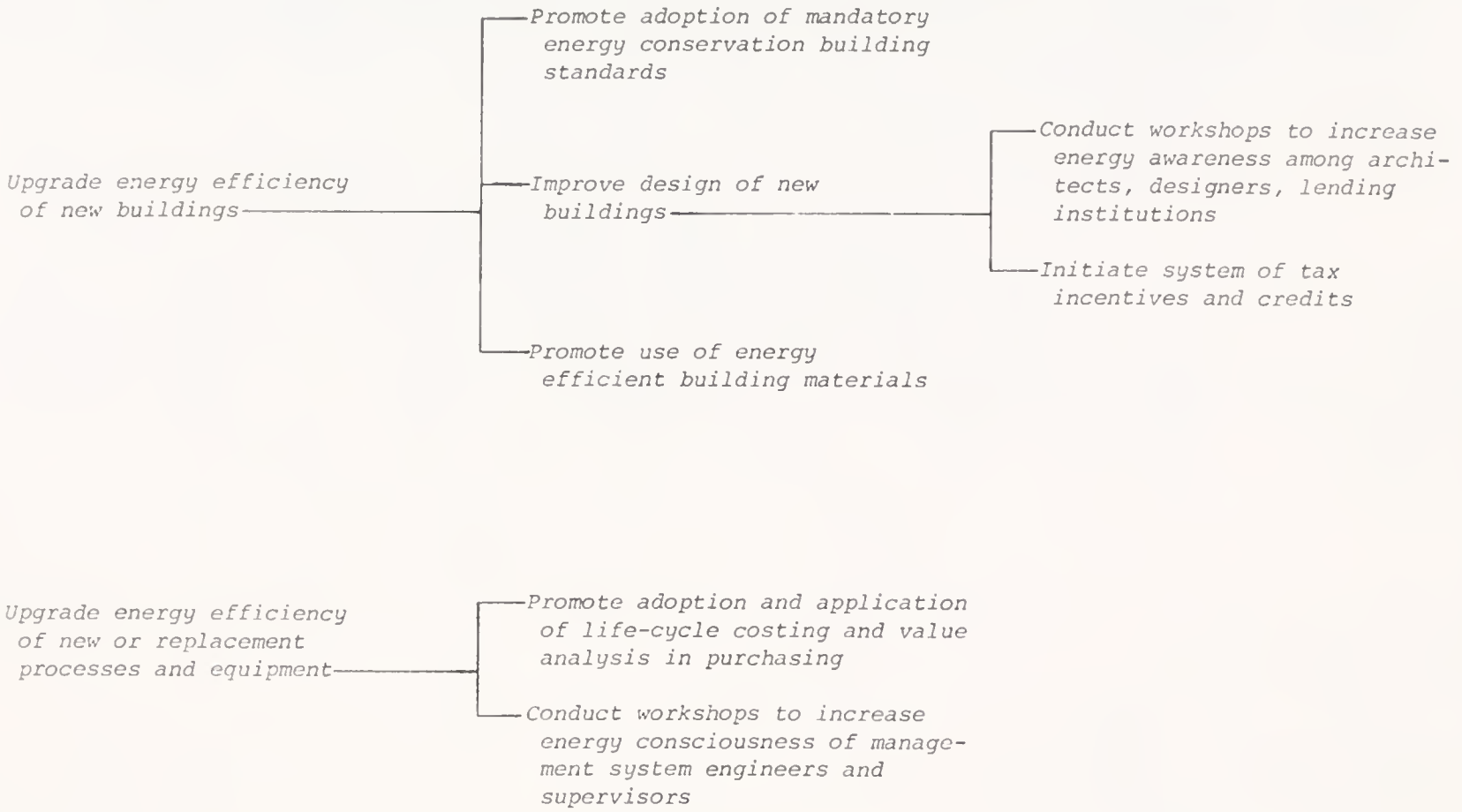
Upgrade energy efficiency of new buildings
Promote adoption of mandatory energy conservation building standards
Improve design of new buildings
Conduct workshops to increase energy awareness among architects, designers, lending institutions
Initiate system of tax incentives and credits
Promote use of energy efficient building materials
Upgrade energy efficiency of new or replacement processes and equipment
Promote adoption and application of life-cycle costing and value analysis in purchasing
Conduct workshops to increase energy consciousness of management system engineers and supervisors

Figure IV-15. INDUSTRIAL SECTOR
Chart 2

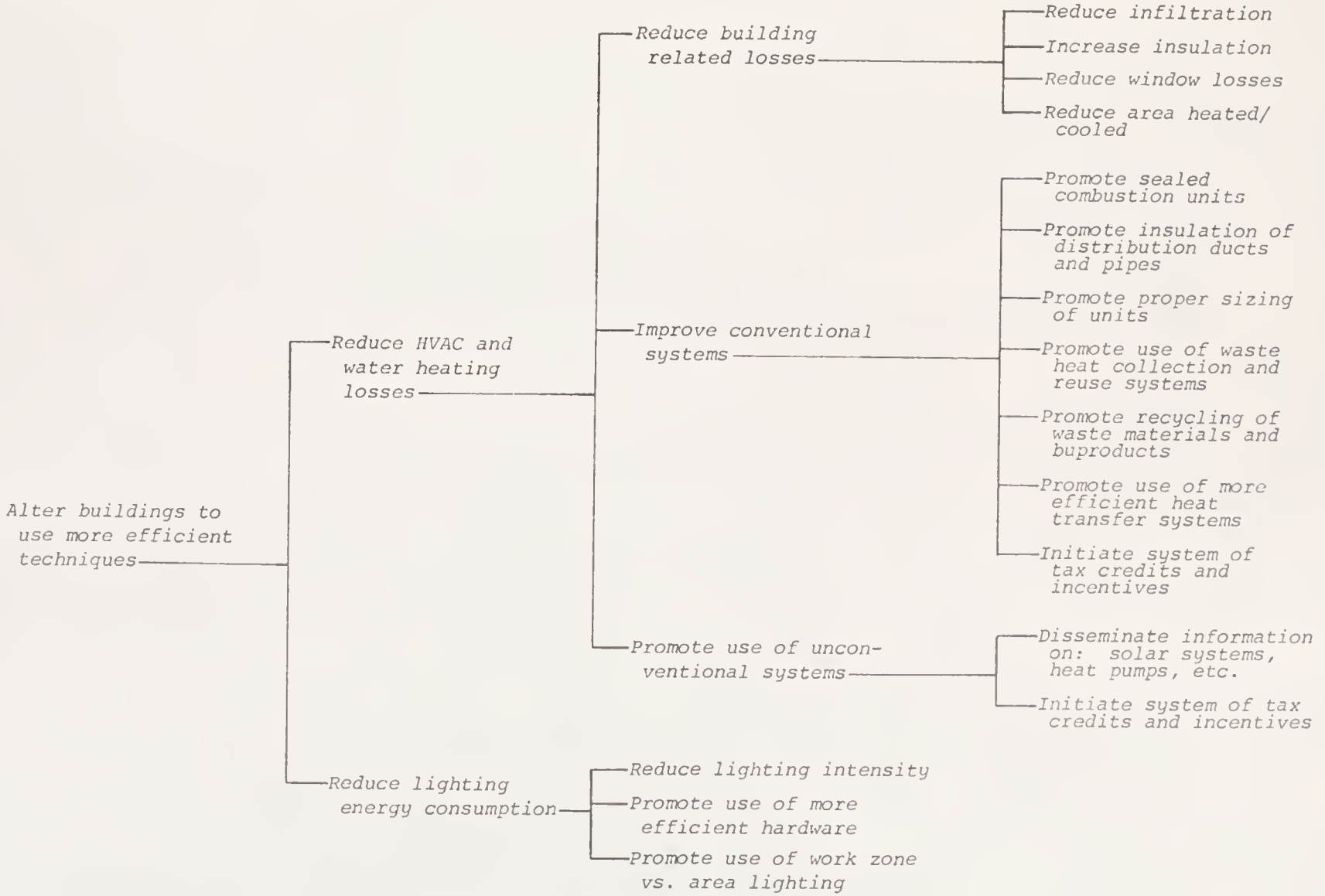
Alter buildings to use more efficient techniques
Reduce HVAC and water heating losses
Reduce lighting energy consumption
Reduce building related losses
Improve conventional systems
Promote use of unconventional systems
Reduce infiltration
Increase insulation
Reduce window losses
Reduce area heated/ cooled
Promote sealed combustion units
Promote insulation of distribution ducts and pipes
Promote proper sizing of units
Promote use of waste heat collection and reuse systems
Promote recycling of waste materials and buproducts
Promote use of more efficient heat transfer systems
Initiate system of tax credits and incentives
Disseminate information on: solar systems, heat pumps, etc.
Initiate system of tax credits and incentives
Reduce lighting intensity
Promote use of more efficient hardware
Promote use of work zone vs. area lighting

Figure IV-16. INDUSTRIAL SECTOR
Chart 3

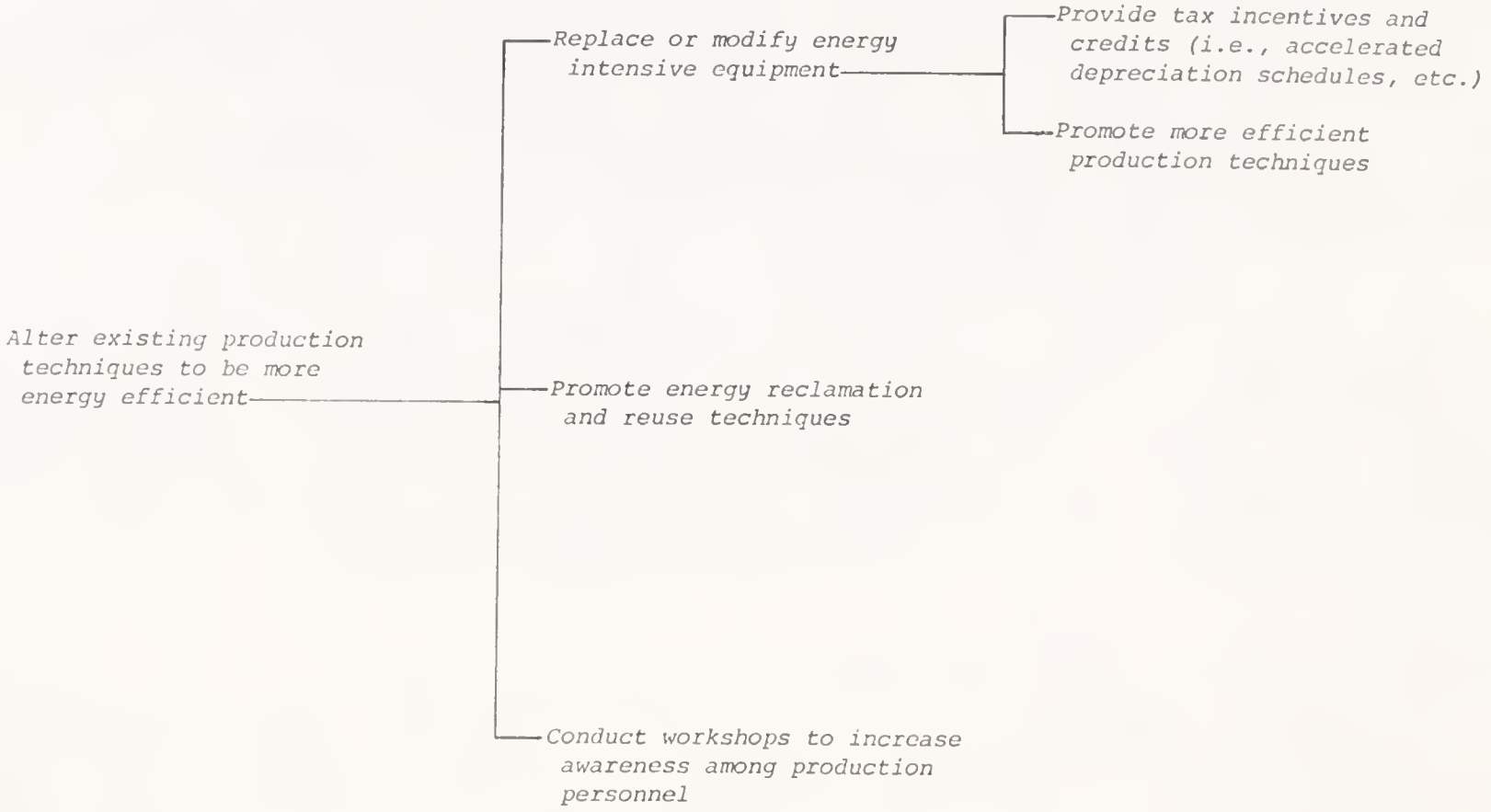
Alter existing production techniques to be more energy efficient
Replace or modify energy intensive equipment
Provide tax incentives and credits (i.e., accelerated depreciation schedules, etc.)
Promote more efficient production techniques
Promote energy reclamation and reuse techniques
Conduct workshops to increase awareness among production personnel

Figure IV-17. INDUSTRIAL SECTOR
Chart 4

AGRICULTURAL PRODUCTION SECTOR

The agricultural production sector accounts for 4.4 percent of Montana's fuel and electric usage, including the natural gas and oil required to produce needed fertilizer and pesticides. The production of crops in Montana accounts for 95 percent of the energy used in agriculture, while livestock production requires 5 percent. Fertilizer and pesticides manufacturing consumes 44 percent of the total energy used in crop production; and field operations and farm vehicles account for 56 percent.

It should be noted that these energy consumption estimates pertain only to that used in producing crops and livestock. The energy consumption estimates relating to heating/cooling of residences and buildings, transportation of products and the processing of commodities are included in other sectors.

GENERAL APPROACH

The basic approach we propose to follow in impacting the agricultural production sector is one of enlightenment and education in energy conservation concepts. Because the agricultural production sector accounts for only 4.4 percent of Montana's energy consumption, we recognize that any significant impact on statewide energy consumption by the agricultural production sector would require reductions impossible to achieve without destroying Montana's agriculture. However, since Montana is an agricultural state, anything we can do to save energy and reduce the costs of operation for this large segment of our population would seem to be warranted.

The following logic charts outline those activities we consider necessary to impact this sector. It should be noted that the costs of implementation are relatively low. Most of our work will consist of coordinating resources already in place within the state.

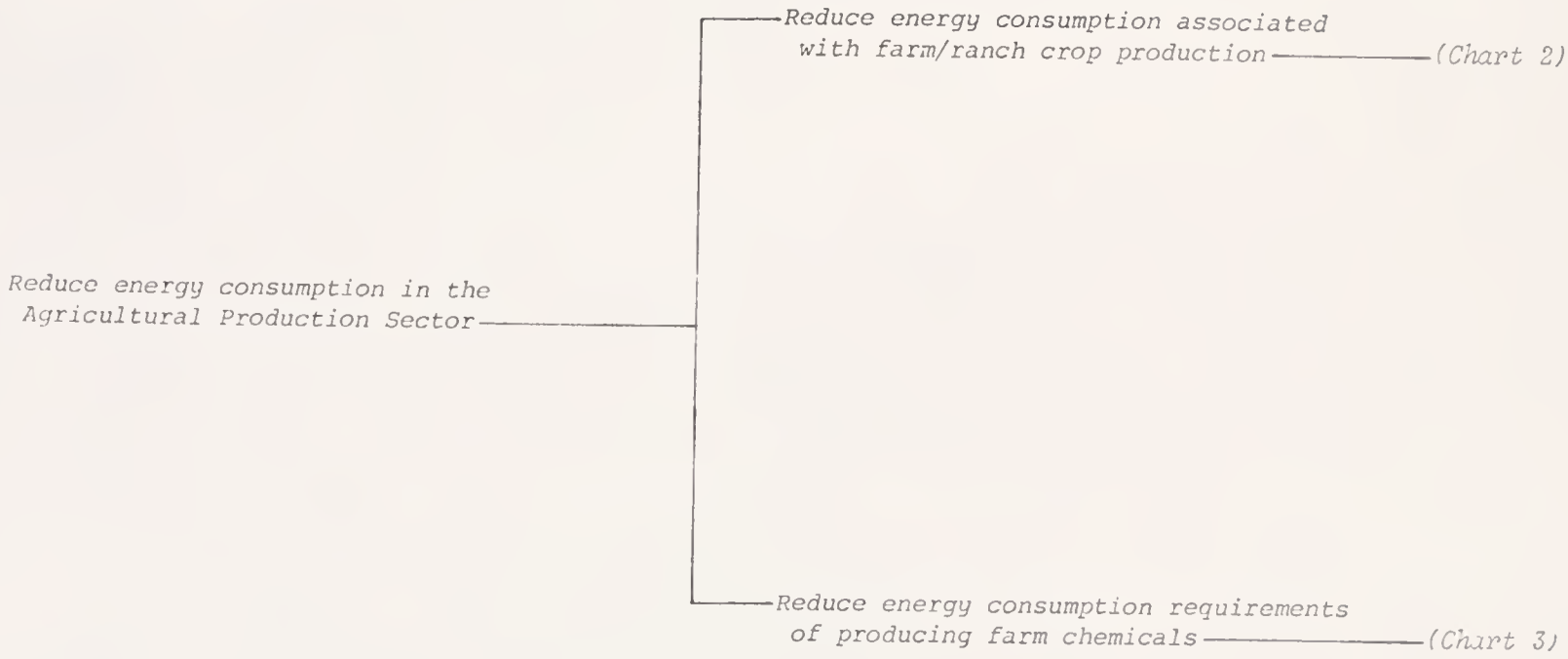
Reduce energy consumption in the Agricultural Production Sector
Reduce energy consumption associated with farm/ranch crop production
(Chart 2)
Reduce energy consumption requirements of producing farm chemicals
(Chart 3)

Figure IV-18. AGRICULTURAL PRODUCTION SECTOR
Chart 1

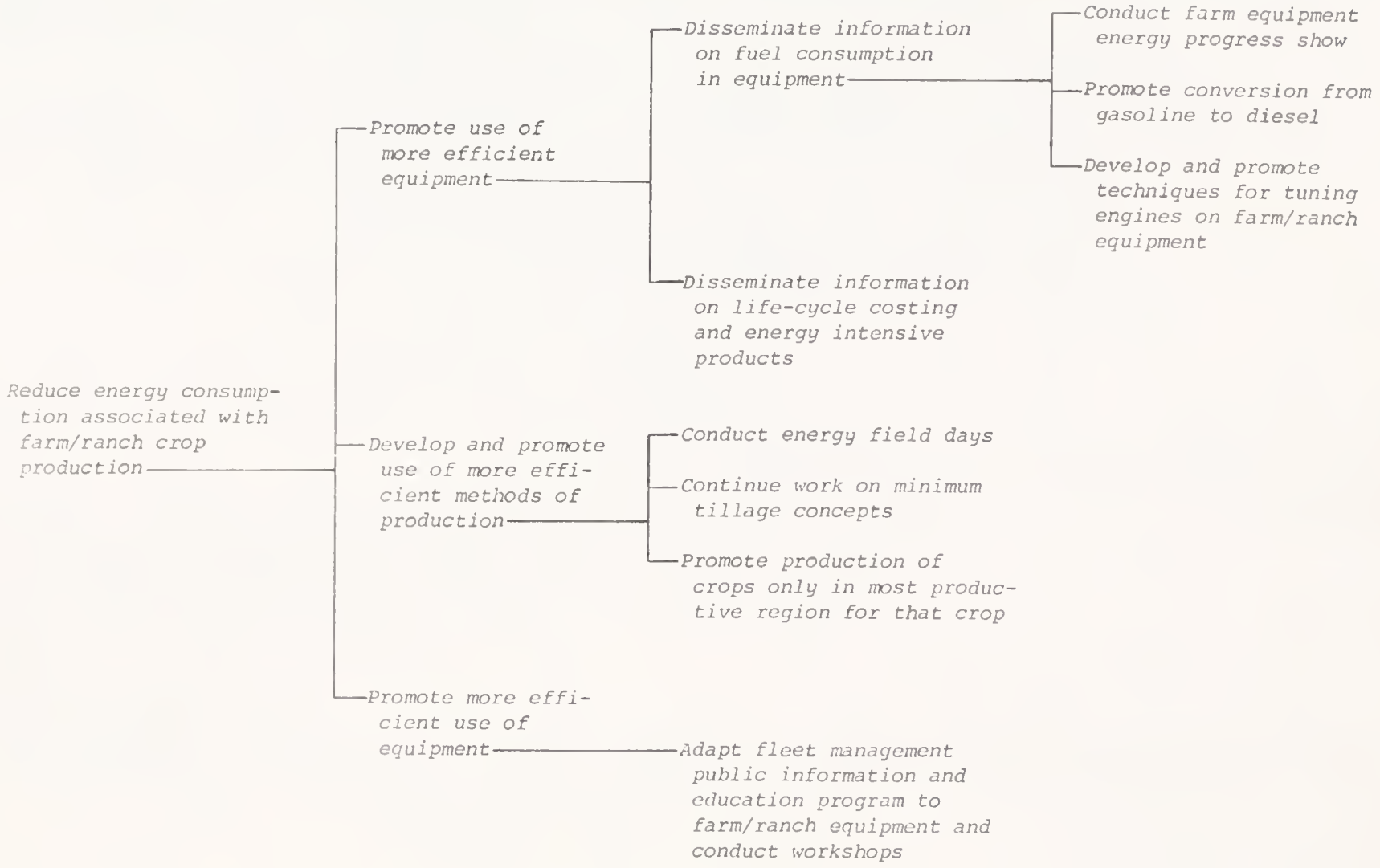
Reduce energy consumption associated with farm/ranch crop production
Promote use of more efficient equipment
Disseminate information on fuel consumption in equipment
Conduct farm equipment energy progress show
Promote conversion from gasoline to diesel
Develop and promote techniques for tuning engines on farm/ranch equipment
Disseminate information on life-cycle costing and energy intensive products
Develop and promote use of more efficient methods of production
Conduct energy field days
Continue work on minimum tillage concepts
Promote production of crops only in most productive region for that crop
Promote more efficient use of equipment
Adapt fleet management public information and education program to farm/ranch equipment and conduct workshops

Figure IV-19. AGRICULTURAL PRODUCTION SECTOR
Chart 2

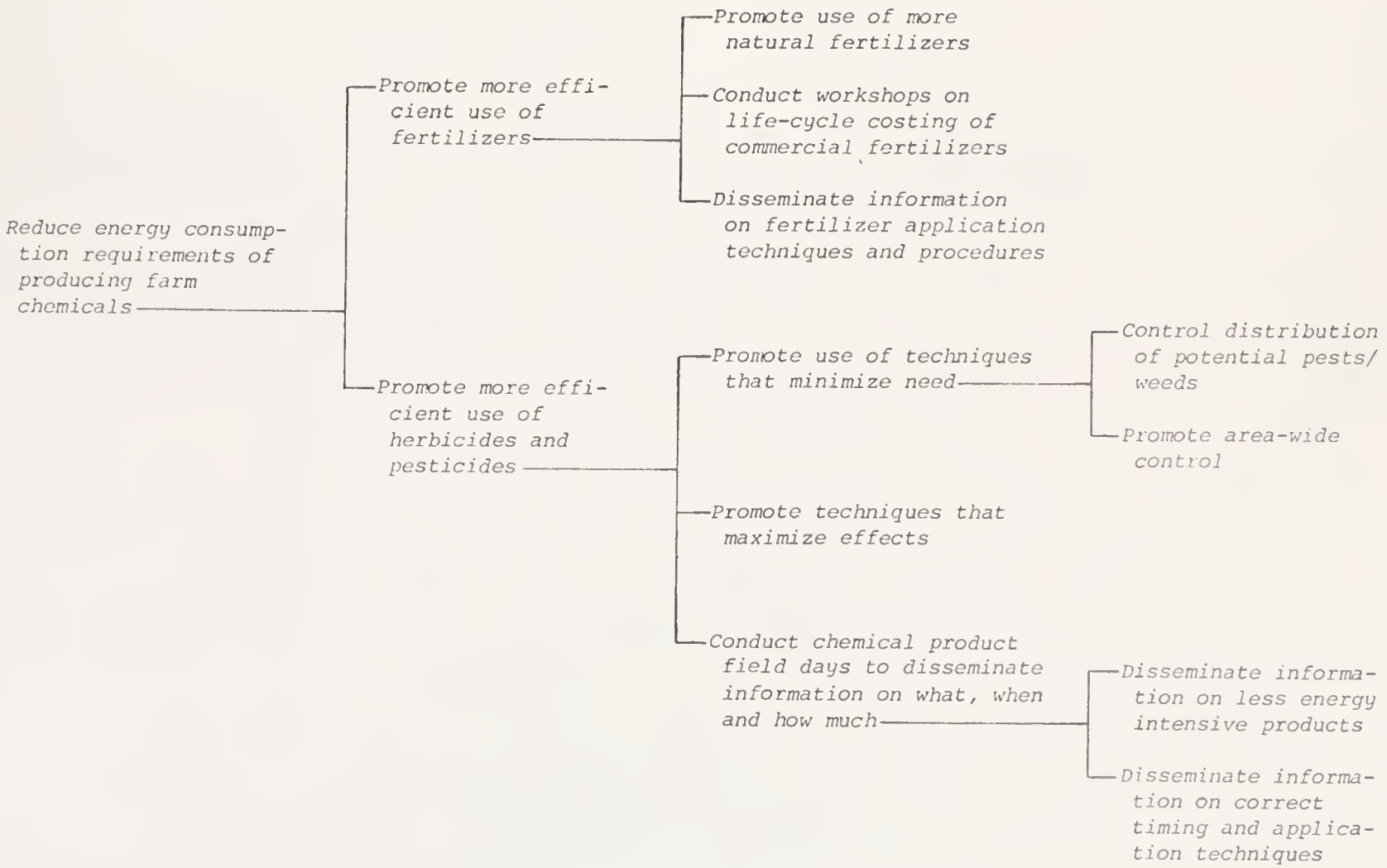
Reduce energy consumption requirements of producing farm chemicals
Promote more efficient use of fertilizers
Promote use of more natural fertilizers
Conduct workshops on life-cycle costing of commercial fertilizers
Disseminate information on fertilizer application techniques and procedures
Promote more efficient use of herbicides and pesticides
Promote use of techniques that minimize need
Control distribution of potential pests/ weeds
Promote area-wide control
Promote techniques that maximize effects
Conduct chemical product field days to disseminate information on what, when and how much
Disseminate information on less energy intensive products
Disseminate information on correct timing and application techniques

Figure IV-20. AGRICULTURAL PRODUCTION SECTOR
Chart 3

PROGRAM ADMINISTRATION

Three specific areas of concern must be addressed if we are to perform our duties of administering the Montana Energy Conservation program in an effective manner:

- Develop and implement a coordination and evaluation measure;
- Develop and implement a measure to monitor and influence research and development projects;
- Develop and implement a financial control measure.

Each of these objectives must be realized if we intend to improve accountability in the program. The tasks designed to lead us toward these objectives which we intend to pursue during the coming year are shown in the logic chart on the following page.

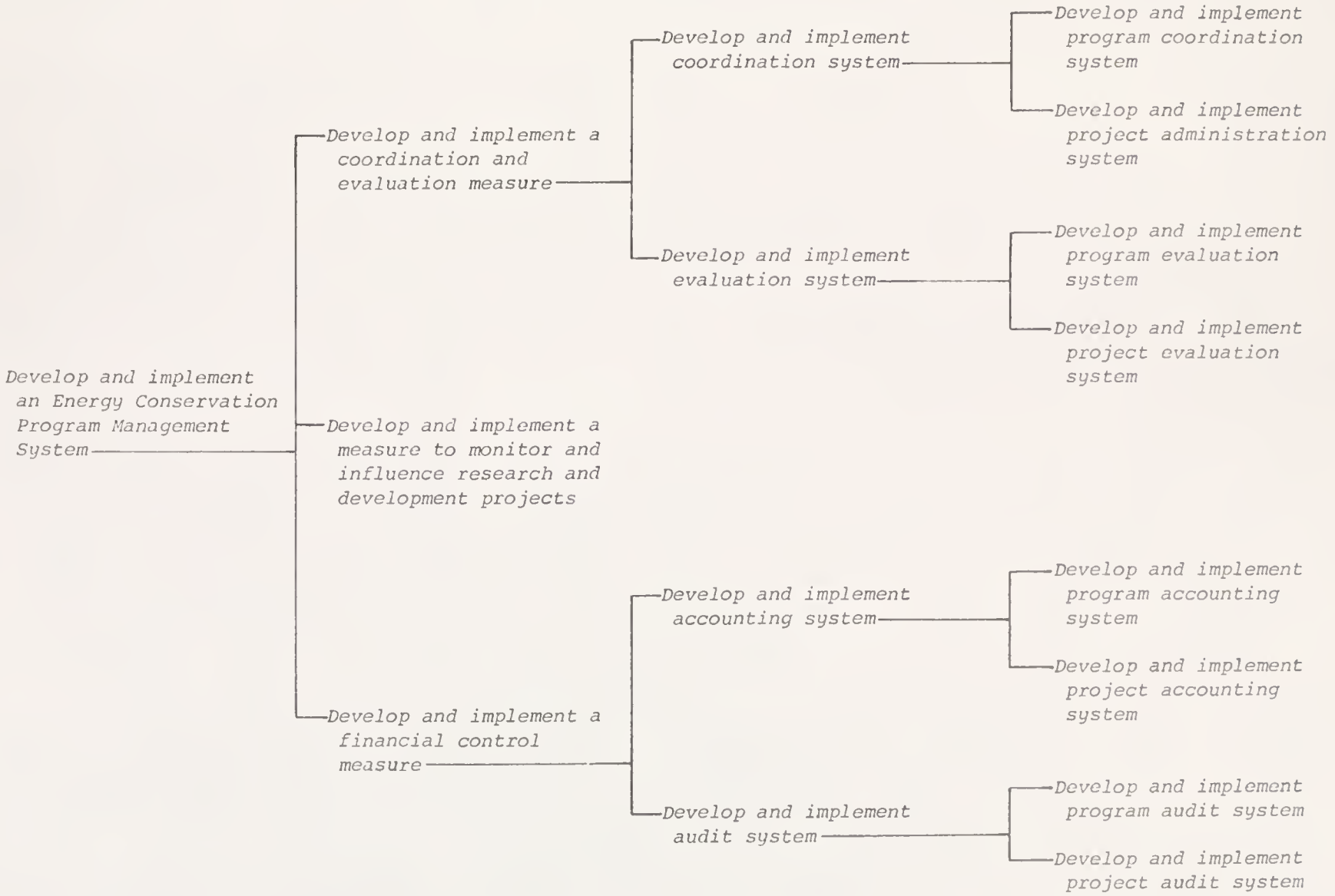
Develop and implement an Energy Conservation Program Management System
Develop and implement a coordination and evaluation measure
Develop and implement coordination system
Develop and implement program coordination system
Develop and implement project administration system
Develop and implement evaluation system
Develop and implement program evaluation system
Develop and implement project evaluation system
Develop and implement a measure to monitor and influence research and development projects
Develop and implement a financial control measure
Develop and implement accounting system
Develop and implement program accounting system
Develop and implement project accounting system
Develop and implement audit system
Develop and implement program audit system
Develop and implement project audit system

Figure IV-21. PROGRAM MANAGEMENT LOGIC CHART

CHAPTER V

EVALUATION PLAN

As in virtually any activity involving attempts at effecting change, the energy conservation program is in need of a well structured evaluation process. The basic purposes of the evaluation activity is to identify accountability throughout the program and to present information to management that can and will aid in the decision making process as it relates to allocation of scarce resources. In previous chapters of this plan we discussed the great need for better data to assist in this endeavor. One part of the evaluation process converts data into information; i.e., converted to a format with adequate interpretation that facilitates understanding.

It should be noted that some evaluation is beyond our capability to achieve with any degree of success. This area basically covers the research activities necessary to prove or disprove the validity of specific activities. For example, we must accept research findings relating the thickness of insulation to heat loss potential. Establishment of this type of relationship requires resources and time beyond that which we are able to provide. However, given that relationship, we can approximate the reduction in energy consumption in buildings by knowing how many were improved and to what extent. Of course, other factors must also be considered; but if we recognize what it is we are trying to evaluate, the process becomes more meaningful and results more attainable regardless of the complexities encountered.

Energy projects are often complex operations which have multiple effects. Montana proposes to utilize two levels of evaluation to determine the value of its demonstration projects: administrative level and impact level evaluations. The levels of evaluation which will be applied to a particular project will depend upon the range of effects which that project is expected to produce. In this case, the program will contribute to both administrative and impact effects and will require an evaluation at both levels. To aid in plan review, the definitions of administrative and impact level evaluation are presented below.

Administrative Level Evaluation

Administrative level evaluation is defined as a judgment of value or worth based on comparisons of actual task accomplishment or activities to performance goals established. In addition, where possible, there will be an assessment of unit cost and operational efficiency.

Administrative evaluation addresses the middle links of the Chain-of-Action: Project Output or Activities and Efficiency. It is concerned with monitoring and assessing the quantity and efficiency of project operations. By "operations", we mean those services or procedures which were implemented with the funding of the project and which are usually expected to contribute to the accomplishment of an ultimate objective of some type of use reduction. Administrative level evaluation describes these operations. Actual activities are compared to: (1) the baseline or pre-project levels of the same activities; (2) the desired or targeted levels of activity established for the project; and (3) the funding input to the project. This means that

administrative evaluations are used to answer such questions as:

-- What activities are funded?

-- How much energy activity is being generated?

-- Does the activity generated meet expectations or targets?

-- Are we generating activity efficiently and at a reasonable cost?

-- Did the project have the desired short-range effects?

Administrative evaluation is also used to assess achievement of ultimate objectives for projects which are intended to have only administrative effects (e.g., an ultimate objective of establishing a more effective energy use record system).

We propose to design an administrative evaluation for the total project and each individual project measure. The former will provide an overview of all project activities. The latter is meant to allow a more detailed examination of the quantity and efficiency of activity within each project component.

Examples of evaluation measures might be:

-- Persons requesting and receiving energy audits;

-- Persons requesting and receiving technical assistance;

-- Workshops conducted and numbers attending in target group;

-- Number of buildings retrofitted to energy conservation standards.

Impact Level Evaluation

Impact level evaluation is defined as a determination of the extent to which task operations and activities have contributed to the achievement of an objective related to energy conservation. The three basic aspects of

an impact evaluation are: (1) determination of impact; (2) determination of the relationship of project activity or accomplishment to documented impact; and (3) determination of the relationship of cost to impact.

Impact evaluation addresses the last link in the Chain-of-Action and measures the achievement of ultimate objectives (use reduction). It also attempts to determine the cost-savings to society of any observed reduction in energy use or substitution.

Impact evaluation involves the use of scientific inferential techniques to identify cause-effect relationships between what the project did and what happened to the energy problem in the project community. As was true for administrative evaluation, this will require comparison. In our program, measures of energy use during project operation period will be compared to pre-project rates, and may also be compared to similar data for the same time periods in one or more comparison states. These comparisons are complicated in impact evaluation by the necessity of including the quantity of pre-project activity in the calculations. These evaluations answer such questions as:

-- Is there a statistically significant change in trends?

-- Is the change in use trends related to project accomplishments or to other outside factors?

-- What is the cost-benefit payoff of a particular program?

Sometimes a particular type of effect is difficult to measure directly. In such cases, impact evaluation must utilize surrogate or proxy measures of these events. For example, if we know the number of homes or buildings having been improved through better insulation, heating system modifications or any

other of our proposed countermeasures, we can calculate what the energy savings might be. We recognize that a better and more reliable methodology would be to actually measure changes in consumption, but the proxy measure approach may be more realistic and sufficiently reliable when one considers the costs and difficulties involved in collection of actual consumption data.

It should be noted that, in contrast to administrative evaluation, impact evaluation does not lend itself to development of a large number of specific evalutation measures. The basic question to be answered through impact evaluation is:

-- Can we detect a reduction in energy consumption as a result of our activities?

The program evaluation system to be developed as a part of the Program Adminstration section of this energy conservation plan, page 168, must recognize the complexities of assessing energy use in the various sectors. A variety of assessment techniques, both administrative and impact, will be used in evaluating program effectiveness.

CHAPTER VI

ENVIRONMENTAL RESIDUALS STATEMENT

The State of Montana has made a commitment to environmental protection. Every citizen's right to a clean and healthful environment is protected constitutionally in Montana.

In general, a decrease in energy consumption results in positive environmental benefits due to reduced environmental degradation from energy conversion. Also, the aspect of individual participation in energy conservation promotes an increased sense of community and a feeling of participation in an action that is socially important. Thus, participating in a large-scale, coordinated energy conservation program may have, in fact, a synergistic environmental benefit. People conserving energy realize that their actions will have positive environmental consequences and, hence, may open their eyes to other areas where they can act individually in an environmentally beneficial manner.

Environmental residuals specifically were considered in developing this plan from both a state and a national perspective and no program is included which, in our judgment, has a significant negative environmental impact. This current revision of the Montana Energy Conservation Plan does not include any changes which will cause any significant modification of the original FEA environmental residuals calculations. The FEA environmental residuals summary follows.

Table VI-1
Direct Emissions From Automobile Operation
(Environmental Impact per 10^{12} BTU of Gasoline)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.			
Suspended Solids			
Non-degradable Org.			
Biological Oxygen Demamd			
Chemical Oxygen Demand			
Air (tons)			
Particulates	62	5.56	344.72
Oxides of Nitrogen	298	5.56	1,656.88
Sulfur Dioxide	15	5.56	83.40
Hydrocarbons	201	5.56	1,117.56
Carbon Monoxide	2,120	5.56	11,787.20
Carbon Dioxide	74,500	5.56	414,220.00
Aldehydes		5.56	
Other			
Thermal Rejection (BTU)			
Occupational Death (Men)			
Occupational Injuries (Men)			
Occupational Man-Day Lost (Man-Day)			
Solid Waste (tons)			

Note: Data courtesy of the Federal Energy Administration.

Table VI-2
Direct Emission From Diesel Bus Operation
(Environmental Impact per 10^{12} BTU of Diesel Oil)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.			
Suspended Solids			
Non-degradable Org.			
Biological Oxygen Demand			
Chemical Oxygen Demand			
Air (tons)			
Particulates	45.7	.01	.457
Oxides of Nitrogen	1,296.0	.01	12.960
Sulfur Dioxide	94.8	.01	.948
Hydrocarbons	127.0	.01	1.270
Carbon Monoxide	787.0	.01	7.870
Carbon Dioxide	80,000.0	.01	850.000
Aldehydes	20.7	.01	.207
Other			
Thermal Rejection (BTU)			
Occupational Death (Men)			
Occupational Injuries (Men)			
Occupational Man-Day Lost (Man-Day)			
Solid Waste (tons)			

Note: Data courtesy of the Federal Energy Administration.

Table VI-3
Emissions From Production and Distribution of Vehicle Fuels
(Environmental Impact per 10^{12} BTU of Vehicle Fuels)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.	0.40	5.55	2.22
Suspended Solids	0.76	5.55	4.22
Non-degradable Org.	2.41	5.55	13.38
Biological Oxygen Demand	0.76	5.55	4.22
Chemical Oxygen Demand	4.66	5.55	25.86
Air (tons)			
Particulates	3.20	5.55	17.76
Oxides of Nitrogen	26.00	5.55	144.30
Sulfur Dioxide	23.50	5.55	130.43
Hydrocarbons	26.00	5.55	33.30
Carbon Monoxide	3.00	5.55	16.65
Carbon Dioxide		5.55	
Aldehydes	4.15	5.55	23.03
Other			
Thermal Rejection (BTU)			
Occupational Death (Men)	0.0007	5.55	.0039
Occupational Injuries (Men)	.05	5.55	.2775
Occupational Man-Day Lost (Man-Day)	2.50	5.55	13.88
Solid Waste (tons)	48.00	5.55	266.40

Note: Data courtesy of the Federal Energy Administration.

Table VI-4
Space Heat, Commercial, Natural Gas
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.			
Suspended Solids			
Non-degradable Org.	.02	2.289	.046
Biological Oxygen Demand		2.289	
Chemical Oxygen Demand		2.289	
Air (tons)			
Particulates	9.25	2.289	21.20
Oxides of Nitrogen	152.06	2.289	348.10
Sulfur Dioxide	.314	2.289	.719
Hydrocarbons	3.95	2.289	9.04
Carbon Monoxide	9.72	2.289	139,629.00
Aldehydes	4.90	2.289	11.22
Other			
Thermal Rejection (BTU x 10^9)	.89	2.289	2.04
Occupational Death	.0002	2.289	.0005
Occupational Injuries (Men)	.03	2.289	.069
Occupational Man-Day Lost (Man-Day)	92.80	2.289	212.42
Solid Waste (tons)			

Note: Data courtesy of the Federal Energy Administration.

Table VI-5
Space Heat, Commercial, Distillate Oil
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.	.40	.596	.238
Suspended Solids	.76	.596	.453
Non-degradable Org.	2.40	.596	1.430
Biological Oxygen Demand	.76	.596	.453
Chemical Oxygen Demand	4.66	.596	2.780
Air (tons)			
Particulates	57.26	.596	34.130
Oxides of Nitrogen	242.98	.596	144.820
Sulfur Dioxide	137.45	.596	81.920
Hydrocarbons	37.17	.596	22.150
Carbon Monoxide	75.00	.596	44.700
Carbon Dioxide	85,000.00	.596	50,660.000
Aldehydes	11.40	.596	6.790
Other			
Thermal Rejection (BTU)		.596	
Occupational Death (Men)	.0007	.596	.0004
Occupational Injuries	.05	.596	.0298
Occupational Man-Day Lost (Man-Day)	2.50	.596	1.490
Solid Waste Tons	48.00	.596	28.610

Note: Data courtesy of the Federal Energy Administration.

Table VI-6
Space Heat, Commercial, Residual Oil
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.	0.39	.299	.117
Suspended Solids	0.76	.299	.227
Non-degradable Org.	2.41	.299	.721
Biological Oxygen Demand	0.76	.299	.227
Chemical Oxygen Demand	4.66	.299	1.390
Air (tons)			
Particulates	80.06	.299	23.94
Oxides of Nitrogen	226.90	.299	67.84
Sulfur Dioxide	540.50	.299	161.62
Hydrocarbons	36.40	.299	10.88
Carbon Monoxide	3.47	.299	1.038
Carbon Dioxide	85,000.00	.299	25,415.00
Aldehydes	7.5	.299	2.24
Other			
Thermal Rejection (BTU)			
Occupational Death (Men)	.0007		.0002
Occupational Injuries (Men)	.049		.015
Occupational Man-Day Lost (Man-Day)	2.52		.753
Solid Waste (tons)	48.02		14.360

Note: Data courtesy of the Federal Energy Administration.

Table VI-7
Space Heat, Commercial, Coal (26.2 x 10^6 BTU/Ton) (1% Sulfur)
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases	.99		
Dissolved Solids, Mis.	26.70		
Suspended Solids	5.77		
Non-degradable Org.			
Biological Oxygen Demand			
Chemical Oxygen Demand			
Air (tons)			
Particulates	443.90		
Oxides of Nitrogen	125.80		
Sulfur Dioxide	755.40		
Hydrocarbons	48.34		
Carbon Monoxide	206.10		
Carbon Dioxide	111,000.00		
Aldehydes	1.33		
Other			
Thermal Rejection (BTU)			
Occupational Death (Men)	.07		
Occupational Injuries (Men)	1.22		
Occupational Man-Day Lost (Man-Day)	92.20		
Solid Waste	8,696.00		

Note: Data courtesy of the Federal Energy Administration.

Table VI-8
Space Heat, Residential, Natural Gas
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.			
Suspended Solids			
Non-degradable Org.	.02	3.416	.068
Biological Oxygen Demand			
Chemical Oxygen Demand			
Air (tons)			
Particulates	9.24	3.416	31.60
Oxides of Nitrogen	127.50	3.416	435.50
Sulfur Dioxide	.31	3.416	1.10
Hydrocarbons	3.96	3.416	13.10
Carbon Monoxide	9.68	3.416	33.10
Carbon Dioxide	61,000.00	3.416	208,376.00
Aldehydes	4.86	3.416	16.60
Other			
Thermal Rejection (BTU x 10^9)	.89	3.416	3.00
Occupational Death (Men)	.0002	3.416	.0007
Occupational Injuries (Men)	.03	3.416	.10
Occupational Man-Day Lost (Man-Day)	.90	3.416	3.10
Solid Waste (tons)			

Note: Data courtesy of the Federal Energy Administration.

Table VI-9
Electric Generation, Steam (Coal-Fired)
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids	12.1	6.99	84.6
Bases	1.0	6.99	7.0
Dissolved Solids, Mis.	62.5	6.99	435.9
Suspended Solids	9.0	6.99	62.9
Non-degradable Org.	1.3	6.99	9.1
Biological Oxygen Demand			
Chemical Oxygen Demand			
Air (tons)			
Particulates	7.35*	6.99	51.4
Oxides of Nitrogen	348.0	6.99	2,432.5
Sulfur Dioxide	160.0*	6.99	1,118.4
Hydrocarbons	8.4	6.99	58.7
Carbon Monoxide	23.1	6.99	161.5
Carbon Dioxide	104,000.0	6.99	726,960.0
Aldehydes	0.68	6.99	4.8
Other			
Thermal Rejection (BTU x 10^9)	249.0	6.99	1,740.5
Occupational Death (Men)	.0759	6.99	.53
Occupational Injuries (Men)	1.32	6.99	9.2
Occupational Man-Day Lost (Man-Day)	96.26	6.99	672.9
Solid Waste (tons)	1,394.00	6.99	9,744.1

*/ Local utilities must be consulted to take account of abatement factors for particulates and sulfur emissions.

Note: Data courtesy of the Federal Energy Administration.

Table VI-10
Space Heat, Residential, Distillate Oil
(Environmental Impact per 10^{12} BTU)

Impact	Coefficient for Reduction	Energy Reduction	Resultant Emission Reduction
Water (tons)			
Acids			
Bases			
Dissolved Solids, Mis.	.40	.352	.14
Suspended Solids	.76	.352	.27
Non-degradable Org.	2.41	.352	.85
Biological Oxygen Demand	.76	.352	.27
Chemical Oxygen Demand	4.66	.352	1.64
Air (tons)			
Particulates	39.16	.352	13.78
Oxides of Nitrogen	39.18	.352	24.35
Sulfur Dioxide	136.45	.352	48.03
Hydrocarbons	37.17	.352	13.08
Carbon Monoxide	20.80	.352	7.32
Carbon Dioxide	85,000.00	.352	29,920.00
Aldehydes	11.34	.352	3.99
Other			
Thermal Rejection (BTU)			
Occupational Death (Men)	.0007	.352	.0002
Occupational Injuries (Men)	.05	.352	.018
Occupational Man-Day Lost (Man-Day)	2.50	.352	.88
Solid Waste (tons)	48.00	.352	16.90

Note: Data courtesy of the Federal Energy Administration.

Table VI-11
Tally Sheet of Reductions in Emissions, Etc. (Other)

	Thermal Reject	Occupational Death	Occupational Injury	Occupational Man-Day Lost	Solid Waste
1.					
2. Gasoline Veh.					
3. Diesel Bus					
4. Refinery, Veh. Fuel		-.004	-.278	-13.9	-266.4
5. S.H. Commercial Gas	2.04	-.0005	-.069	-212.4	
6. S.H. Commercial D. Oil		-.0004	-.0298	-1.49	-28.61
7. S.H. Commercial R. Oil		.0002	.015	.753	-14.36
8. S.H. Commercial, Coal					
9. S.H. Residential, Gas	3.0	-.0007	-.10	3.1	
10. S.H. Residential, D. Oil		-.0002	-.018	-.88	-16.90
11. Elec. Gen.--Gas T.--Gas					
12. Elec. Gen.--Gas T.--Oil					
13. Elec. Gen.--Steam--Gas					
14. Elec. Gen.--Steam--Oil					
15. Elec. Gen.--Steam-Coal	1,740.5	-.53	-9.2	-672.9	-9,744.1
Totals	1,745.5	-.54	-9.71	-905.4	-10,070.4

Note: Data courtesy of the Federal Energy Administration.

Table VI-12
Tally Sheet of Reductions in Emissions, Etc. (Other)

	Acids	Bases	Dis. Solids	Sus. Solids	Non-Deg. Org.	Bio. O.D.	Chem. O.D.
1.							
2. Gasoline Veh.							
3. Diesel Bus							
4. Refinery, Veh. Fuel			-2.2	-4.2	-13.4	-4.2	-25.9
5. S.H. Commercial Gas					-.046		
6. S.H. Commercial D. Oil			-.238	-.453	-1.430	-.453	-2.78
7. S.H. Commercial R. Oil			-.117	-.227	-.721	-.227	-1.39
8. S.H. Commercial, Coal	0	0	0	0	0	0	0
9. S.H. Residential, Gas	0	0	0	0	-.068	0	0
10. S.H. Residential, D. Oil	0	0	-.14	-.27	-.85	.27	1.64
11. Elec. Gen.--Gas T.--Gas							
12. Elec. Gen.--Gas T.--Oil							
13. Elec. Gen.--Steam--Gas							
14. Elec. Gen.--Steam--Oil							
15. Elec. Gen.--Steam--Coal	-84.6	-7.0	-436.9	-62.9	-9.1		
Totals	-84.6	-7.0	-439.6	-68.1	-25.6	-5.2	-31.7

Note: Data courtesy of the Federal Energy Administration.

Table VI-13

Tally Sheet of Reductions in Emissions, Etc. (Air)

	Particulates	Nitrogen Dioxide	Hydrocarbons	CO	CO_2	Aldehydes
1.						
2. Gasoline, Veh. 1/	-344.7	-1,656.9	-83.4	-1,117.6	-11,787.2	-414,220
3. Diesel Bus 1/	+.5	+13.0	+.9	+1.3	+7.9	+850.0 .2
4. Refinery, Veh. Fuel 1/	-17.5	-144.3	-130.4	-33.3	-16.7	--- -23.0
5. S.H. Commercial Gas 2/ 4/	-21.2	-348.1	-.719	-9.04	-22.3	-139,629 -11.22
6. S. H. Commercial D. Oil 2/	-34.13	-144.8	-81.92	-22.15	-44.7	-50,660 -6.79
7. S. H. Commercial R. Oil 2/	-32.94	-67.84	-161.62	-10.88	-1.04	-25,415 -2.24
8. S. H. Commercial, Coal 2/	---	---	---	---	---	--- ---
9. S. H. Residential, Gas 3/	-31.6	-435.5	-1.1	-13.5	-33.1	208,376 -16.6
10. S. H. Residential D. Oil 3/	-13.78	-24.35	-48.03	-13.08	-7.32	-29,920 -3.99
11. Elec. Gen.--Gas T.--Gas	---	---	---	---	---	--- ---
12. Elec. Gen.--Gas T.--Oil	---	---	---	---	---	--- ---
13. Elec. Gen.--Steam--Gas	---	---	---	---	---	--- ---
14. Elec. Gen.--Steam--Oil	---	---	---	---	---	--- ---
15. Elec. Gen.--Steam--Coal	-51.4	-2,432.5	1,118.4	-58.7	-161.5	-726,960 .8
Totals	-538.1	-5,241.3	-1,624.7	-1,277.0	-12,060.0	-1,594,330 -68.421

1/ Includes Program Measures 3, 5, 5a, 5b, 5c and 10.
2/ Includes Program Measures 1, 2, 3, 3a, 9 and 10, and industrial sector.
3/ Includes Program Measures 1, 6, 7, 8, 9, and 10.
4/ Includes LPG.

Data courtesy of FEA